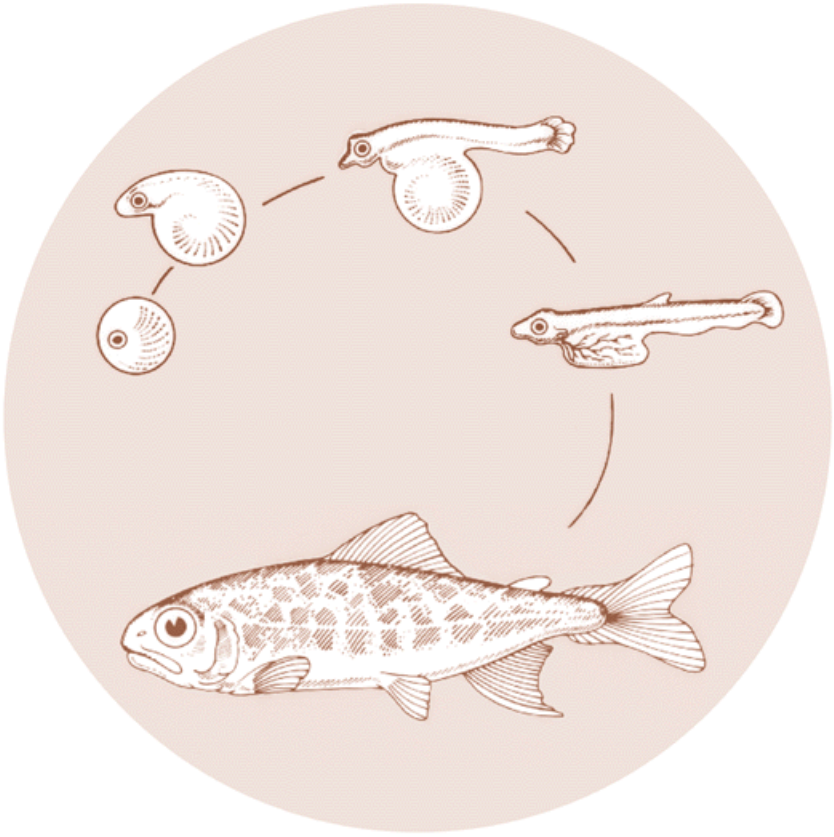
August 1989

AUGMENTED FISH HEALTH MONITORING

Annual Report



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AUGMENTED FISH HEALTH MONITORING

Annual Report

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Contract No. DE-AI79-87BP35585

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ABSTRACT

Augmented Fish Health Monitoring Contract DE-AI79-87BP35585 was implemented on July 20, 1987. Second year activities focused on full implementation of disease surveillance activities and histopathological support services to participating state agencies. Persistent and sometimes severe disease losses were caused by infectious hematopoietic necrosis (IHN) in summer steelhead trout in Idaho and in spring chinook salmon at hatcheries on the lower Columbia River, Diagnostic capability was enhanced by the installation, for field use, of enzyme-linked immunosorbent assay (ELISA) technology at the Dworshak Fish Health Center for the detection and assay of bacterial kidney disease and by a "dot-blot" training session for virus identification at the Lower Columbia Fish Health Center. Complete diagnostic and inspection services were provided to 13 Columbia River Basin National Fish Hatcheries. Case history data was fully documented in a computerized data base for storage and analysis. This report briefly describes work being done to meet contract requirements for fish disease surveillance at Service facilities in the Columbia River basin. It also summarizes the health status of fish reared at those hatcheries and provides a summary of case history data for calendar year 1988.

INTRODUCTION

Fish health surveillance is essential to the production of healthy hatchery smolts. Healthy fish are needed to properly manage anadromous fish populations and to mitigate the losses caused by hydroelectric power generation, Reliable and comparable fish health data, derived by similar techniques and degrees of surveillance, is of great importance to the evaluation of fishery management and mitigation strategies. Also, detailed information on fish health is needed whenever hatchery fish are used in research studies. With BPA guidance, an interagency steering committee determined required levels of fish health monitoring and the techniques to be used for sampling and examining fish from hatcheries,

This report covers the second year of activity carried out by the U, S. Fish and Wildlife Service's three Fish Health Centers serving the 13 Columbia River basin National Fish Hatcheries (NFH's).

MATERIALS AND METHODS

The Service operates 13 National Fish Hatcheries in the Columbia River basin (Table 1.) The three Fish Health Centers serving these hatcheries are located at Olympia, Washington, the Dworshak NFH near Orofino, Idaho, and at the Spring Creek NFH on the Washington side of the Columbia River across from Hood River, Oregon. Each FHC provides viral, bacterial, parasitic and non-infectious disease diagnostic and fish health monitoring services to the facilities in their geographical area. In addition, half-time personnel and laboratory facilities are provided at the Olympia FHC for histopathological and electron microscopy services which are also available to the four state agencies participating in the BPA-sponsored Augmented Fish Health Monitoring program. Each FHC has computers for data storage and analysis. The Service's Regional Fish Health Manager, located in the Portland, Oregon Regional Office coordinates, but does not supervise, the activities of the FHC's and serves as the Service's Technical Representative, Data summaries, periodic reports and other submissions required by the contract are prepared from the computer database and written reports from the fish health centers and provided to BPA by the Technical Representative.

Monitoring for infectious diseases was enhanced during the year by the installation of enzyme-linked immunosorbent assay (ELISA) equipment and technology at the Dworshak FHC. Colleen Hesson has developed the required precision and expertise to accurately process hundreds of fish tissue samples for the detection of Renibacterium salmoninarum soluble antigen, The Dworshak FHC processed kidney samples collected from 574 adult spring chinook at the Warm Springs NFH in support of segregation studies grouping progeny from ,adults according to the R. salmoninarum soluble antigen levels detected in the adults at the time of spawning, All but 50 females were found positive.

Dr. Phil MC Allister, virologist at the Service's National Fish Health Research Laboratory at Leetown, WV, presented a one-day training course for Service fish pathologists in "Dot-Blot" techniques for identifying salmonid viruses including those causing infectious hematopoietic necrosis, viral hemorrhagic septicemia, and infectious pancreatic necrosis, The training session was held on April 6, 1989 at the Lower Columbia FHC and was attended by pathologists or lead technicians from all four FHC's in the Service's Pacific Region.

Complete fish health monitoring was carried out on adult and juvenile salmon and steelhead trout at each of the 13 NFH's. Sampling and laboratory procedures used were those listed in the Fish Health Section – American Fisheries Society "Bluebook" of diagnostic techniques (Amos, 1985), those required by the Service's fish health protection program, or those required to meet requirements set forth for the contract by the interagency steering committee. The results of this work have been reported in the Service's fish health database and summarized in quarterly reports already submitted.

RESULTS AND DISCUSSION

Service fish health monitoring activities supported by the Augmented Fish Health Monitoring contract can be grouped into three major categories. Determination of organosomatic indices is carried out on "B" strain summer steelhead at the Dworshak NFH and on "tule" fall chinook at the Spring Creek NFH. Second, there is on-site fish health monitoring for disease detection and diagnosis. Third, there is histopathological support for the fish health monitoring activities of the Service and participating states.

Determination of Organosomatic Indices

Organosomatic indices are an array of morphometric, physiological, and clinical chemistry measurements collected to document the physical condition of fish. The system is predicated on the idea that fish survival, contribution to fisheries, or return for spawning (performance) can be linked to one or more measurable physiological characteristics. This is a prospective study. The relationship between fish performance and their organosomatic indices during rearing or at the time of release cannot be determined until a bank of data has been collected.

Service personnel at the Dworshak FHC and at the Lower Columbia FHC use a Lotus 1-2-3 spread sheet program developed by Ron Goede, fish pathologist for the state of Utah, who developed the organosomatic indices concept and trained Pacific Northwest fish pathologists in its use.

Sampling of "B" strain summer steelhead at Dworshak NFH has been conducted for two years. In 1988, a total of 76 fish were individually dissected and examined, In 1989, 80 fish were processed (Tables 1 a. and 1 b.). In each case, changes could be noted as smoltification progressed. Changes in body condition factor, gills, and internal fat could be correlated with the onset of smoltification. No thing strikingly unusual was noted and no problems were encountered.

Tule fall chinook sampling at Spring Creek NFH has consisted of individual examinations of 200 or more random fish per release group, In 1988, over 400 fish were sampled and in 1989, 609 fish were processed (Tables 2 a., 2 b., and 2 c.). Great care is taken in weighing fish because large errors can be introduced when cubic factors are applied in the calculation of condition factors. Excellent health and quality has been documented in Spring Creek tule fall chinook released in 1988 and 1989. Onset of smoltification has been correlated with minor increases in descaling .

Monitoring for Infectious Diseases of Hatchery Fish

Whirling Disease (Myxobolus cerebralis) -- Juvenile anadromous fish, older than five months of age and reared in facilities supplied with surface water, were examined for the presence of M. cerebralis. Neither whirling disease nor the parasite were detected at any of the 13 Columbia River basin NFH's.

Ceratomyxosis (Ceratomyxa Shasta) -- Adult anadromous salmonids that died prior to spawning and juveniles reared in facilities supplied with surface water during September and October were screened for C. Shasta, Adult salmon at most lower Columbia River NFH's were found with light to heavy C. Shasta infections but ceratomyxosis was not diagnosed as a cause of mortality during post-mortem examinations of adults salmon dying before they could be spawned. C. Shasta was not detected in juveniles.

Infectious Hematopoietic Necrosis (IHN) -- IHN caused the loss of the greatest number of fish reared in the 13 Columbia River NFH's. This disease also delayed the release of upriver bright fall chinook salmon destined for the Yakima River, in central Washington, and prevented the release of brood-year 1987 spring chinook into Oregon's Umatilla River. The prevalence of IHN virus in returning spring chinook adults ranged from none detected in Entiat NFH adults to 95% in adults returning to Little White Salmon. High IHNV prevalences also were noted in adult spring chinook at Carson and Leavenworth NFH's. Over 75% of the upriver bright fall chinook adults spawned at Little White Salmon NFH also were positive for IHNV, A correlation with locations seems stronger than correlations with fish stocks. Local brood stock holding environments may be an important factor governing the prevalence of IHNV in adults at spawning time,

Severe losses to IHN continued to occur in juvenile steelhead reared at the Dworshak and Kooskia NFH's. This is the first year for IHN losses at Kooskia where

mortalities among 1988 brood year fry or fingerlings exceeded 85%. Persistent low level losses to IHN occurred at Carson and Little White Salmon NFH's and caused the destruction of rainbow trout reared at the Warm Springs NFH.

Infectious Pancreatic Necrosis (IPN) -- No IPN virus was detected in any of the adult or juvenile fish tested at the 13 Columbia River NFH's. All viral samples processed for fish health monitoring or Fish and Wildlife Service inspections are inoculated onto EPC and CHSE-214 cell lines,

Erythrocytic Inclusion Body Syndrome (EIBS) -- Inclusion bodies in erythrocytes typical of EIBS were reported in 0.7% of the tule fall chinook adults at the Spring Creek NFH. Inclusion bodies also were found in 5% of the adult spring chinook at both the Entiat and Leavenworth NFH's. The syndrome also was detected in spring chinook smolts at Entiat (13.3%) and in summer steelhead smolts at Leavenworth (1.6%). No losses were directly attributed to EIBS.

Bacterial Kidney Disease (BKD) -- Data on the occurrence of BKD in Columbia River basin spring chinook adults and juveniles is long and complex. Highlights include an obvious correlation between the observed prevalence and the severity of infections in adult with the prevalence and severity of the disease in their progeny. "Normal" prevalences among smolts can be placed in the 5 to 15% range. Above that range BKD can cause severe impairment in migrating smolts, BKD is deemed to have the potential for severe impacts on spring chinook smolts released from Winthrop (60%+), Dworshak (15 - 40%+), Entiat (23%+), Little White Salmon (23%), and Kooskia (16.7%+),

ELISA techniques are being used to measure antigen levels in adult spring chinook returning to the Warm Springs NFH, In test of the 1988 brood year adults 524 of 574 fish were positive for Renibacterium salmoninarum antigen. All 50 negative fish were females. The levels of detected antigen were used to segregate progeny into groups from high and low BKD parents. These fish will be marked with coded wire tags prior to release. In tests involving two brood years, progeny from low BKD parents have returned to the hatchery at a rate three times higher than predicted by the release numbers. Progeny from high BKD adults, the larger of the two groups, returned at a rate approximately 70% of predicted,

At the Dworshak NFH, approximately 35 % of the spring chinook in two ponds of fish marked with coded wire tags suffered exophthalmus (popeye) due to R. salmoninarum behind the eye, When kidneys from fish with bacteria behind the eye were sampled, only 70% were diagnosed R. salmoninarum-positive based upon FAT examination of kidney tissues. This could have great significance, not only to disease monitoring procedures and data analysis, but also to the use of coded wire tags in fish populations already known to have moderate to high BKD prevalences.

Bacterial Coldwater Disease (BCWD) -- Data collected and analyzed from work carried out under this contract has shown a strong correlation between the stresses of crowding and low water exchange rates during the early rearing of coho salmon fingerlings and the incidence and severity of BCWD. Corrective action to prevent

over-crowding of coho fry and early fingerlings at the Willard NFH has greatly reduced BCWD impacts after several years of difficulty with this disease, BCWD remains a persistent and debilitating problem among coho reared at the Eagle Creek NFH where oxytetracycline therapy did not provide a long-term remedy and mortalities and deformed fish persisted after treatment.

Furunculosis - - Aeromonas salmonicida, the causative agent of furunculosis, is frequently detected in pre-spawning adult spring chinook. At times, furunculosis can cause pre-spawning mortalities. The disease is seasonally related and is seldom a problem among adult anadromous fish returning or held during cooler seasons of the year. Prevalences of A. salmonicida among adult spring chinook ranged from a high of 19% at Carson to 2% at Little White Salmon. Eagle Creek coho adults also bore a 19% prevalence, No fish losses were attributed to furunculosis and sanitation and egg disinfection procedures seem to prevent the spread of disease to juveniles.

Enteric Redmouth (ERM) -- In past years, ERM caused losses in summer steelhead reared at the Hagerman NFH. This year ERM occurred in Hager-man "A" strain summer steelhead and required a course of antibiotic therapy. In 1989, the tule fall chinook at Spring Creek were free of the disease for the first time since 1973, Rigorous sanitation of the oyster shell filter beds with large quantities of formalin seems to have halted problems with ERM and Ichthyophthirius both of which could impair migration or seawater adaptation, Good contribution to the fishery and a high return rate to the hatchery is expected of the 1988 brood year tule fall chinook from Spring Creek.

See Table 4. for a station by station summary of fish'health status,

Histopathological Support Services

Histological examinations by John Morrison at the Olympia FHC has shown that 100% of the spring chinook smolts released from the Entiat NFH are infected with an unidentified species of Myxobolus. Approximately 1 in 3 of these fish is heavily infected with spores displacing cranial and spinal nerves, A study to determine if the infection is seasonal is under way,

At Winthrop NFH a previously unidentified blood organism was observed to mature into spores that appear to belong to the genus Sphaerospora. This possibly is the same "derby hat" spore reported from Winthrop in the mid-1960's. Even though extremely high numbers of these organisms can be found in some fish there seems to be little affect.

During the year histopathological services were provided to Columbia River basin facilities as follows:

USFWS.	479 samples
Wash. Dept. Fish . . .	215 samples

Wash, Dept. Wldlf, . .	122 samples
Oreg. Dept. F & W, . .	14 samples
Idaho Dept. F & G. . .	0 samples
Electron microscopy. .	31 samples

A contract has been negotiated with the Montlake Laboratory of the National Marine Fisheries Service, in Seattle, WA, for Ms. Carla Stehr to provide electron microscopy services. A number of samples are being processed by Ms. Stehr at this time (July, 1989).

PROJECT STATUS BY OBJECTIVE AND TASK

The Statement of Work in Augmented Fish Health Monitoring contains six objectives, At the end of the second year of this project, the accomplishment status of each Objective, and the Tasks listed therein, is as follows:

Objective 1.0: Complete Start-up Phase

Tasks 1.1, 1.2, and 1.3 . . . . . Completed

Objective 2.0: Serve on the Project Technical Steering Committee

Task 2.1 Attend Technical Steering Committee meetings . . . . . On-going

Task 2.2 Submit technology transfer plan. . . . . Completed

Task 2.3 Submit a list of "facility impediments" to fish health....., ... Completed

Objective 3.0: Conduct Augmented Fish Health Monitoring

Task 3.1 Perform organosomatic analyses . . . . . On-going

Task 3.2 Conduct field work identified in Table 2.1 (On schedule ; no problems foreseen.). . . . . On-going

Task 3.2.1 Provide histopathological support services for state and Service participants. (Half-time support was provided throughout the year). . . . . On-going

Objective 4.0: Conduct Studies of Hatchery Water Supplies

Task 4.1 Submit a water sampling plan . . . . . Completed

Task 4.2 Collect and analyze water samples. Work awaits BPA guidance and contract. . . . . On-going

Task 4.3 Determine/record flow and density indices (This data is recorded on each case history.). . . . . On-going

Objective 5.0: Coordinate, Record, Analyze and Report Fish Health Monitoring and Related Data

Task 5.1 Submit forms and formulae . . . . . Completed

Task 5.2 Record data (Over 3,000 case histories in computerized database at this time) . . . . . On-going

Task 5.3 Submit quarterly data summaries . . . . . On-going

Task 5.4 Coordinate databases with other agencies (Awaiting guidance). . . . . On-going

Objective 6.0: Estimate the Project's Benefits

Task 6.1 Report Table 2.3 data for all Table 2.2 facilities for three years prior to start of contract . . . . . Completed

Tasks 6.1.1 through 6.1.5 Existing data required for these sub-tasks is scattered in several different files and forms in hatchery records and in Regional Office files. Available data will be provided as soon as possible. . . . . On-going

CONCLUSIONS

Participation by the Fish and Wildlife Service in this interagency project has been productive since the outset. Improved fish disease surveillance (see Table 1.). enhanced interagency coordination and the development of parity in diagnostic services in the field are immediate benefits. In addition, shared technology and methodology has helped all participants improve efficiency and the sensitivity of laboratory procedures.

The patient support by Ron Morinaka is appreciated. He has worked effectively to clarify contract obligations, convene and moderate Technical Steering Committee meetings and facilitated Service efforts to meet requirements,

LITERATURECITED

Amos, K. H,, Editor, 1985. Procedures for the detection and identification of certain fish pathogens. 3rd Edition, Fish Health Section, American Fisheries Society, Corvallis, Oregon. 114 p.

Piper, R. G., I. B. McElwain, L. E. Orme, J. P. McCraren, L. G. Fowler, and J. R. Leonard. 1982, Fish hatchery management, U. S, Dept. of the Interior, Fish and Wildlife Service, Washington, D. C., 517 p.

SUMMARY OF FISH AUTOPSY

LOCATION: DUORSHAK **QUAL. CONTROL INSPECT. NO.: DW012**

Species: STEELHEAD Autopsy Date: 4/6-4/10 **Sample Size:** 40
Strain: B'5 **Age:** '12 MONTHS **Tissue Collection** No.: NA
Mark/Lot: DW(H)8802 Disease Survey No.: NA
Unit: PONDS #6-20-44-AND 5 **Water** Temp.: 48 F **Case History No.:** NA
Fish Source: DWORSHAK Water Hardness: 14 ppm Custody No.: NA
Egg Source: DWORSHAK **Investigator:** STEINER/LIENTZ
Hatching Date: NA Reason for Autopsy: SMOLT ASSESSMENTS
Remarks: NA

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
Length	217.980 mm	24.68 mm	11%
Weight	98.900 gr	26.4 gr	27%
Ktl*	0.950	0.07	7%
Ctl**	3.432		
Hematocrit	48.430	4.13	9%
Leucocrit	NA	NA	NA
Plasma Protein	7.190	0.83	12%

*Expressed as Ktl times 10 to the fifth power
**Converted from Ktl; expressed as Ctl times 10 to the fourth power

VALUES AS PERCENT OF TOTAL SAMPLE

EYES	GILLS	PSEUDO-BRANCHS	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 98%	N 93%	N 100%	0 98%	0 NA	B 73%	0 98%	N 100%	A 100%	0 100%
B1 0%	F ox:	S 0%	1 3%	1 NA	R 28%	1 3%	S 0%	B 0%	1 0%
B2 0%	C 0%	L 0%	2 0%	2 NA	G 0%	2 0%	M 0%	C 0%	2 0%
E1 0%	M 0%	S&L 0%	x 0.0	3 NA	ND 0%	x 0.0	G 0%	D 0%	3 0 %
E2 0%	P 3%	I 0%		4 NA	E 0 %		u 0%	E 0%	x 0.0
H1 0%	OT 0%	OT OX:		x NA	OT 0%		OT 0%	F 0%	
H2 0%								OT 0%	
M1 0%									
M2 ox:									
OT ox:									

Summary of Normals

98%	93%	100%	98%		100%	98%	100%	100%	

Summary of Means

			0.0	NA		0.0			0.0

SEX : M: 45% F: 55% u: 0%

GENERAL REMARKS

FINS NA

SKIN NA

GONADS NA

OTHER NA

SUMMARY OF FISH AUTOPSY

LOCATION: DUORSHAK **Qual. CONTROL INSPECT. NO.:** DW013

Species: STEELHEAD
Strain: B'S
Mark /lot : DW(H)8803
Unit: PONDS #51-64-75-AND
Fish Source: DWORSHAK
Egg Source: DWORSHAK
Hatching Date: NA
Remarks: NA

Autopsy Date: 4/10 AND
Age: 12 MONTHS
Water Temp.: 48 F
Water Hardness: 1.4 ppm
Investigator: STEINER
Reason for Autopsy: Smolt ASSESMENTS

Sample Size: 40
Tissue Collection No.: NA
Disease Survey No. : NA
Case History No.: NA
Custody No.: NA

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
Length	211.500 mm	35.47 mm	17%
Weight	95.380 gr	40.43 gr	42%
Ktl*	1.010	0.1	10%
Ctl**	3.649		
Hematocrit	49.500	3.67	7%
Leucocrit	NA	NA	NA
Plasma Protein	7.830	0.99	13%

*Expressed as Ktl times 10 to the fifth power
**Converted from Ktl; expressed as Ctl times 10 to the fourth power

VALUES AS PERCENT OF TOTAL SAMPLE

	EYES	GILLS	PSEUDOBRANCH	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N	98%	N 55%	N 100%	0 100%	0 0%	B 15%	0 100%	N 100%	A 78%	0 0%
B1	0%	F 0%	S 0%	1 0%	1 25%	R 85%	1 0%	S 0%	B 23%	1 0%
B2	0%	C 0%	L 0%	2 0%	2 48%	G 0%	2 0%	M 0%	C 0%	2 0%
E1	0%	M 0%	S&L 0%	x 0.0	3 28%	NO 0%	x 0.0	G 0%	D 0%	3 100%
E2	0x1	P 5%	I 0%		4 0%	E 0%		U 0%	E 0%	x 3.0
H1	0%	OT 0%	OT 0%		x 2.0	OT 0%		OT 0%	F 0%	
H2	0%								OT 0%	
M1	0%									
M2	0%									
OT	0%									

Summary of Normals

98%	55%	100%	100%	100%	100%	100%	100%	

Summary of Heans

			0.0	2.0		0.0		3.0

SEX: M: 30% F: 70% u: 0%

GENERAL REMARKS

FINS NA

SKIN NA

GONADS NA

OTHER NA

SUMMARY OF FISH AUTOPSIES

Location: Spring Creek NFH
Fish Lot No(s): 8BHSC
Fish Source: Spring Creek
Unit: 4-8,10,17-20,25,26,28,30,31,36,37,40-44
Reason for Autopsy: March pre-release
Investigator(s): SL/CN/TN

Autopsy Date: March 8, 1989
Species: FCS
Age: Fingerling
Water Temp. 48°
Sample Size: 202

Remarks: Some hematocrits may be higher; a result of fish being stressed in bucket

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
Length	76.00 mm	4.18	0.05
Weight	5.68 gm*		
K_{tl}	8.5210^{-6}**		
C_{tl}	3.01X10^{-4}***		
Hematocrit	40.37	2.88	0.07
Leucocrit	N/A	N/A	N/A
Serum Protein	5.04	0.70	0.14

*Weighed in groups of 9-10 fish/pond, 22 ponds sampled
**Averaged over 22 groups of 9-10 fish per pond
***Cm&ted from K_{tl}

VALUES AS PERCENTOF TOTAL SAMPLE

EYES	GILLS	PSEUDO-BRANCHS	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	OPERC.
N 100%	N 100%	N 100%	0 99%	0 0%	R 0%	0 99%	N 100%	0 99%	N 100%
B1 0%	F 0%	S 0%	1 1%	1 4%	B 100%	1 1%	S 0%	1 0%	S 0%
B2 0%	C 0%	L 0%	2 0%	2 94%	G 0%	2 0%	M 0%	2 0%	M 0%
E1 0%	M 0%	S&L 0%		3 2%	No 0%		L 0%	3 1%	
E2 0%	P 2%	I 0%		4 0%	E 0%		G 0%	4 0%	
H1 0%	H 0%				L 0%			5 0%	
H2 0%								6 0%	
M1 0%									
M2 0%									

Summary of Normals

100%	98%	99%	97%		100%	99%	100%	99%	100%

GENERAL REMARKS

FINS: No fin erosion

SKIN: N/A

OTHER: No scale loss.

SUMMARY OF FISH AUTOPSIES

Location: Spring Creek NFH
Fish Lot No(s): 8BTSC, 8SC, 8BHSC
Fish Source: Spring Creek
Unit:1,2,9,10,11,13,15,16,19,22-24,26-29
Reason for Autopsy: April pre-release
Investigator(s): KS/CN/TN

Autopsy Date: April 12, 1989
Species: FCS
Age: Fingerling
Water Temp. 49-51°
Sample Size: 207

Remarks: None

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
Length	88.00 mm	5.88	0.07
Weight	6.97 gm*		
K_{tl}	1.03x10-5**		
C_{tl}	3.73x10-4***		
Hematocrit	47.40	3.97	0.08
Leucocrit	N/A	N/A	N/A
Serum Protein	5.80	0.79	0.14

*Weighed in groups of 12-13 fish/pond, 16 ponds sampled
**Averaged over 16 groups of 12-13 fish per pond
***Converted from K_{tl}

VALUES AS PERCENT OF TOTAL SAMPLE

EYES	GILLS	PSEUDO-BRANCHS	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	OPERC.
N 100%	N 100%	N 100%	0 100%	0 0%	R 6%	0 96%	N 100%	0 100%	N 100%
B1 0%	F 0%	S 0%	1 0%	1 5%	B 94%	1 4%	S 0%	1 0%	S 0%
B2 0%	C 0%	L 0%	2 0%	2 94%	G 0%	2 0%	M 0%	2 0%	M 0%
E1 0%	M 0%	S&L 0%		3 1%	No 0%		L 0%	3 0%	
E2 0%	P 2%	I 0%		4 %	E 0%		G 0%	4 0%	
H1 0%	H 0%				L 0%			5 0%	
H2 0%								6 0%	
M1 0%									
M2 0%									

Summary of Normals

100%	100%	100%	100%		94%	96%	100%	100%	100%

GENERAL REMARKS

FINS: N/A

SKIN: N/A

OTHER: 1 fish had descaling at 20%, 1 had 5% descaling.

SUMMARY OF FISH AUTOPSIES

LOCATION: Spring Creek NFH
Fish Lot No(s): 8BTSC, 8SC
Fish Source: Spring Creek
Reason for Autopsy: May pre-release
Investigator(s): SL/CN/TN

Autopsy Date: May 17, 1989
Species: FCS
Unit: 2-7,14,17,18,20,21,25,30-44
Age: Fingerling
Water Temp. 50-52°
Sample Size: 200

Remarks: Some hematocrits may be higher; a result of fish being stressed in bucket

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
Length	108.00 mm	6.33	0.05
Weight	12.12 gm*		
K_{tl}	9.76X10-6**		
C_{tl}	3.53x10-4***		
Hematocrit	41.00	3.02	0.07
Leucocrit	N/A	N/A	N/A
Serum Protein	4.00	0.56	0.14

*Weighed in groups of 7-8 fish/pond, 28 ponds sampled
**Averaged over 28 groups of 7-8 fish per pond
***Converted from K_{tl}

VALUES AS PERCENTOF TOTAL SAMPLE

EYES	GILLS	PSEUDO-BRANCHS	THYMUS	MESEN. FAT	SPLEEN	GUT	HIND KIDNEY	LIVER	OPERC.
N 100%	N 98%	N 99%	0 97%	0 0%	R 16%	0 99%	N 100%	0 99%	N 100%
B1 0%	F 0%	S 1%	1 3%	1 1%	B 84%	1 1%	S 0%	1 0%	S 0%
B2 0%	C 0%	L 0%	2 0%	2 45%	G 0%	2 0%	M 0%	2 0%	M 0%
El 0%	M 0%	s&L 0%		3 52%	NO 0%		L 0%	3 1%	
E2 0%	P 2%	I 0%		4 2%	E 0%		G 0%	4 0%	
H1 0%	H 0%				L 0%			5 0%	
H2 0%								6 0%	
Ml 0%									
M2 0%									

Summary of Normals

100%	98%	99%	97%		84%	99%	100%	99%	100%

GENERAL REMARKS

FINS: N/A

SKIN: N/A

OTHER: 5-10% descaling on 7 fish, 3 fish had 25% frayed tail, 1 had 50% frayed tail and 2 had 5% frayed tail.

Table 3. List of Columbia River Basin National Fish Hatcheries

Abernathy Salmon Culture Technical Center 1440 Abernathy Road Longview, WA 98632 David A. Leith, Director	Tule fall chinook salmon
Carson National Fish Hatchery Carson, WA 98610 Bruce M. Mc Leod, Manager	Spring chinook salmon
Dworshak National Fish Hatchery P. 0. Box 18 Ahsahka. ID 83520 Wayne H, Olson, Complex Manager	Summer steelhead trout Spring chinook salmon
Eagle Creek National Fish Hatchery 34288 S. E. Rainbow Road Estacada, OR 97023 Douglas Dysart, Manager	Coho salmon Winter steelhead trout
Entiat National Fish Hatchery Entiat River Road 6970 Hatchery Drive Entiat. WA 98822 William Thorson, Manager	Spring chinook salmon
Hagerman National Fish Hatchery 3059-D National Fish Hatchery Road Hagennan, ID 83332 David S. Bruhn, Manager	Summer steelhead trout

Table 3. (Continued)

Kooskia National Fish Hatchery Route 1, Box 98-A Kooskia, ID 53539 Manager - Vacant	Spring chinook salmon Summer steelhead trout
Leavenworth National Fish Hatchery P. 0. Box 549 Leavenworth, WA 98826 Gregory A. Pratschner, Complex Manager	Spring chinook salmon Summer steelhead trout
Little White Salmon National Fish Hatchery P. 0, Box 17 Cook, WA 98605 Jack Bodle, Complex Manager	Spring chinook salmon Bright fall chinook salmon Coho salmon
Spring Creek National Fish Hatchery Underwood, WA 98651 Ed La Motta, Manager	Tule fall chinook salmon
Warm Springs National Fish Hatchery P. 0. Box 790 Warm Springs, OR 97761 Gary R. White, Manager	Spring chinook salmon Rainbow trout
Willard National Fish Hatchery P. 0. Box 17 Cook, WA 98605 Jack Bodle, Complex Manager	Coho salmon
Winthrop National Fish Hatchery P. 0. Box 429 Winthrop, WA 98862 William L. Wallien, Manager	Spring chinook salmon Lahontan cutthroat trout Brook trout

Table 4. Summary of Current Health Status of Production Fish at Service Facilities

FACILITY	FISH STOCK	HEALTH STATUS
Abernathy Salmon Culture Technical Cntr.	Tule fall chinook salmon	Heal thy fish
Carson National Fish Hatchery	Spring chinook salmon	Light IHN losses persist in 1989 smolts; EIBS prevalence 10%
Dworshak National Fish Hatchery	Summer steel head trout	IHN losses exceeded 25% in 1989; Ich required treatment
	Spring chinook salmon	BKD prevalence avg. 15%; up to 40% in some ponds
Eagle Creek National Fish Hatchery	Coho sal non	Coldwater disease impacting fish performance; treatments required
	Winter steel head trout	Heal thy fish
Entiat National Fish Hatchery	Spring chinook salmon	BKD 8.3% prevalence; Hyxobolus spores in brains
Hagerman National Fish Hatchery	Summer steelhead trout	BKD 8.8% prevalence; ERM in "A" strain required treatment
Kooskia National Fish Hatchery	Spring chinook salmon	BKD 16.6% prevalence; Ich required treatment; ERM required treatment for first time
	Summer steel head trout	First IHN epizootic - killed 85% of fry
Leavenworth National Fish Hatchery	Spring chinook salmon	BKD 11.7% prevalence: Ich killed two ponds of fish
	Summer steel head trout	Healthy fish
Little White Salmon National Fish Hatch,	Spring chinook salmon	IHN epizootic prevented fish transfer: BKD causing losses - prevalence 23+%
	Bright fall chinook salmon	No IHNV in progeny' coagulated yolk and "developmental problem-"in 1988 BY fry
Spring Creek National Fish Hatchery	Tule fall chinook salmon	Healthy fish; no Ich, no ERM. BKD found in only three morts, none in random samples from aid-pond,

Table 4. Summary of Current Health Status of Production Fish (Continued)

FACILITY	FISH STOCK	HEALTH STATUS
Warm Springs National Fish Hatchery	Spring chinook salmon	BKD prevalence 11-14%; Ich required treatment
	Rainbon trout	IHN forced destruction of lot; replacements from ODF&W healthy
Willard National Fish Hatchery	Coho salmon	Coldwater disease moderate to severe annually
Winthrop National Fish Hatchery	Spring chinook salmon	BKD prevalence at 60%!; Sphaerospora heavy in smolts, impact appears low but unknown
	Lahontan cutthroat trout	Healthy fish
	Brook trout	Furunculosis controlled by Romet-30 therapy

APPENDIX I

CASE HISTORY SUMMARY

COLUMBIA RIVER BASIN NATIONAL FISH HATCHERIES

Calendar Year 1988

In compliance with the requirements of an interagency agreement (DE-AI79 BP355851 on "Augmented Fish Health Monitoring, between the U. S. Fish and Wildlife Service (Service) and the Bonneville Power Administration (BPA), the Service has collected and recorded fish health case history information in a computerized data base. Data from monthly diagnostic visits and other fish disease monitoring work is included.

The following tables summarize case history data for calendar year 1988 as required in contract Task 6.1. At first glance the attached tables are somewhat cryptic. A complete set of definitions is appears at the end of this report as Appendix II. Most items in the ten column report are self-explanatory. These items and a brief explanation are as follows:

1. DATE - Self-explanatory

2. LOCATION - Derived from interagency locator systems, for example:
   Idaho: 16 + Idaho hatchery 95 = 1695 + DWOR = 1695DWOR (Dworshak NFH)
   Oregon: 43 + Oregon hatchery 98 = 4398 + WMSP = 4398WMSP (Warm Springs NFH)
   Washington: 53 + Washington hatchery 99 = 5399 + CRSN = 5399CRSN (Carson NFH)

3. SPE - Species of fish. A three-letter code that is usually self-explanatory:

   URB = Upriver bright fall chinook salmon
   WST = Winter steelhead trout
   SST = Summer steelhead trout

4. FISH/LB - Number of fish per pound

5. AGE - A letter code indicating age of fish. E = Eggs; S = Sac fry (hatched fry usually > 1,000 per pound); F = Fingerling (usually <=1,000 per pound and > 25 per pound; Y = Yearlings (usually hatchery juveniles <= 25 per pound; B = All spawning adults.

6. DEN-IND - Density index calculated as directed by Piper, et al (1982)

7. FLOW-IND - Flow index calculated as directed by Piper, et al (1982)

8 . TEMP-Water temperature in degrees Fahrenheit

9. DIS – Disease or pathogens detected. See Appendix II for full listing. Codes for bacterial diseases begin with the letter "B"; Most names of external parasites begin with the letter "P" Most viral diseases begin with “V”; Sporozoans begin with “S”. Therefore:

BK = Bacterial kidney disease
BW = Coldwater disease
PICH = Ichthyophthirius
PCOS = Costia (now ~~Ichthyobodo~~)
SW = Myxobolus cerebralis
SP = Proliferative kidney disease
vH= Infectious hematopoietic necrosis
VN- Erythrocytic inclusion body syndrome

10. LOSS/MO – Projected percentage loss per month for case reported.

1988 **CASE'HISTORY SUMMARY**

A B E R N A T H Y S A L M O N C U L T U R E T E C H N I C A L C E N T E R

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
04/19/88	5399ABER	FCS	28.70	F	0.33	0.95	57.2	BK	1.00
05/03/88	5399ABER	FCS	26.00	F	0.17	0.49	57.2	BK	0.20
9/14/88	5399ABER	SCS	10.00	Y	0.01	0.71	54.0	VN	0.00
10/28/88	5399ABER	FCS	0.00	B	0.00	0.00	0.0	BK	0.00
10/28/88	5399ABER	FCS	0.00	B	0.00	0.00	0.0	BF	0.00
10/28/88	5399ABER	FCOB	0.00		0.00	0.0	SC		0.00

C A R S O N N A T I O N A L F I S H H A T C H E R Y

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
03/11/88	5399CRSN	SCS	23.00	Y	0.34	1.09	44.0	BK	0.10
03/11/88	5399CRSN	SCS	500.00	F	0.55	1.11	44.0	FP	0.50
04/08/88	5399CRSN	SCS	259.00	F	0.35	1.41	44.0	DD	1.00
05/10/88	5399CRSN	SCS	125.00	F	0.16	0.66	44.0	VH	6.00
06/07/88	5399CRSN	SCS	21.00	Y	0.36	1.16	44.0	NC	0.00
07/06/88	5399CRSN	SCS	80.00	F	0.33	1.12	44.0	VH	0.10
08/08/88	5399CRSN	SCS	59.00	F	0.17	0.64	45.0	VH	0.20
09/16/88	5399CRSN	SCS	41.00	F	0.21	0.80	46.0	DS	0.50
09/21/88	5399CRSN	SCS	0.05	B	0.00	0.00	0.0	BF	0.00
09/21/88	5399CRSN	SCS	0.05	B	0.00	0.00	0.0	VH	0.00
09/21/88	5399CRSN	SCS	0.05	B	0.00	0.00	0.0	SC	0.00
12/01/88	5399CRSN	SCS	31.00	F	0.26	1.08	43.0	NC	0.03

D W O R S H A K N A T I O N A L F I S H H A T C H E R Y

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
01/06/88	1695DWOR	SST	9.00	Y	0.20	0.96	51.6	PEPI	8.28
01/06/88	1695DWOR	SST	9.00	Y	0.20	0.96	51.6	BG	8.28
01/06/88	1695DWOR	SST	9.00	Y	0.20	0.96	51.6	VH	8.28
01/07/88	1695DWOR	SST	8.00	Y	0.25	0.96	51.6	PICH	0.97
01/12/88	1695DWOR	SST	10.00	Y	0.14	0.97	42.8	PTRC	1.99
01/12/88	1695DWOR	SST	10.00	Y	0.14	0.97	42.8	TG	1.99
01/12/88	1695DWOR	SST	10.00	Y	0.14	0.97	42.8	PEP1	1.99
01/15/88	1695DWOR	SST	9.00	Y	0.17	1.15	54.4	PEP1	13.45
01/15/88	1695DWOR	SST	9.00	Y	0.17	1.15	54.4	TG	13.45
01/15/88	1695DWOR	SST	9.00	Y	0.17	1.15	54.4	PICH	13.45
01/15/88	1695DWOR	SST	9.00	Y	0.22	97.00	42.8	PEPI	2.15
01/15/88	1695DWOR	SST	7.00	Y	0.24	0.96	51.6	PICH	1.45
01/15/88	1695DWOR	SST	7.00	Y	0.24	0.96	51.6	PEPI	1.45
01/19/88	1695DWOR	SST	9.00	Y	0.18	0.96	51.6	PEP1	0.99
01/19/88	1695DWOR	SST	24.00	Y	0.12	0.96	51.6	PEP1	6.36
01/19/88	1695DWOR	SST	24.00	Y	0.12	0.96	51.6	PSCY	6.36
01/19/88	1695DWOR	SST	24.00	Y	0.12	0.96	51.6	TG	6.36
01/19/88	1695DWOR	SST	24.00	Y	0.12	0.96	51.6	PICH	6.36
01/19/88	1695DWOR	SST	24.00	Y	0.12	0.96	51.6	VH	6.36
01/20/88	1695DWOR	SST	8.00	Y	0.25	0.96	51.6	BG	0.97
01/21/88	1695DWOR	SST	10.00	Y	0.13	0.97	42.8	PEP1	2.46
01/21/88	1695DWOR	SST	10.00	Y	0.13	0.97	42.8	PCOS	2.46
01/21/88	1695DWOR	SST	10.00	Y	0.19	0.96	51.6	PEPI	1.20
01/25/88	1695DWOR	SST	10.00	Y	0.18	0.96	51.6	PEP1	2.90
01/25/88	1695DWOR	SST	10.00	Y	0.18	0.96	51.6	BG	2.90
01/25/88	1695DWOR	SST	10.00	Y	0.20	0.96	51.6	PEP1	2.15
01/25/88	1695DWOR	SST	10.00	Y	0.20	0.96	51.6	BG	2.15
01/26/88	1695DWOR	SST	10.00	Y	0.20	0.96	51.6	VH	1.85
01/26/88	1695DWOR	SST	9.00	Y	0.17	1.15	54.4	VH	1.41
01/26/88	1695DWOR	SST	9.00	Y	0.16	0.97	42.8	VH	2.67
01/27/88	1695DWOR	SCS	26.50	F	0.23	0.50	39.5	UE	0.08
01/27/88	1695DWOR	SCS	26.50	F	0.23	0.50	39.5	BK	0.08
01/27/88	1695DWOR	SCS	27.20	F	0.21	0.50	39.5	UE	0.04
01/27/88	1695DWOR	SCS	27.20	F	0.21	0.50	39.5	PEPI	0.04
01/27/88	1695DWOR	SCS	27.20	F	0.21	0.50	39.5	BK	0.04
01/27/88	1695DWOR	SCS	29.10	F	0.20	0.50	39.5	UE	0.00
01/27/88	1695DWOR	SCS	29.10	F	0.20	0.50	39.5	PEPI	0.12
01/27/88	1695DWOR	SCS	29.10	F	0.20	0.50	39.5	PTRY	0.12
01/27/88	1695DWOR	SCS	29.10	F	0.20	0.50	39.5	BK	0.12
01/27/88	1695DWOR	SCS	26.20	F	0.20	0.50	39.5	UE	0.07
01/27/88	1695DWOR	SCS	26.20	F	0.20	0.50	39.5	PEP1	0.07
01/27/88	1695DWOR	SCS	26.20	F	0.20	0.50	39.5	PTRY	0.07
01/27/88	1695DWOR	SCS	26.20	F	0.20	0.50	39.5	BK	0.07
01/27/88	1695DWOR	SCS	24.50	Y	0.24	0.50	39.5	PEP1	0.06
01/27/88	1695DWOR	SCS	24.50	Y	0.24	0.50	39.5	PSCY	0.06
01/27/88	1695DWOR	SCS	24.50	Y	0.24	0.50	39.5	UE	0.06
01/27/88	1695DWOR	SCS	24.50	Y	0.24	0.50	39.5	BK	0.06
01/27/88	1695DWOR	SST	29.00	F	0.07	0.50	39.5	TG	0.76
01/27/88	1695DWOR	SST	29.00	F	0.07	0.50	39.5	PEPI	0.76
01/27/88	1695DWOR	SST	12.00	Y	0.13	0.50	39.5	TG	1.55

FISH AND WILDLIFE SERVICE
FISH DISEASE SUMMARY

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
01/27/88	1695DWOR	SST	12.00	Y	0.13	0.50	39.5	UE	1.55
01/27/88	1695DWOR	SCS	26.70	F	0.26	0.50	39.5	UE	0.05
01/27/88	1695DWOR	SCS	26.70	F	0.26	0.50	39.5	PEP1	0.05
01/27/88	1695DWOR	SCS	26.70	F	0.26	0.50	39.5	BK	0.05
01/27/88	1695DWOR	SCS	24.30	Y	2.60	0.50	39.5	UE	0.07
01/27/88	1695DWOR	SCS	24.30	Y	0.26	0.50	39.5	PEP1	0.07
01/27/88	1695DWOR	SCS	24.30	Y	0.26	0.50	39.5	BK	0.07
01/27/88	1695DWOR	SCS	24.10	Y	0.27	0.50	39.5	UE	0.03
01/27/88	1695DWOR	SCS	24.10	Y	0.27	0.50	39.5	BK	0.03
01/28/88	1695DWOR	SST	8.00	Y	0.25	0.96	49.2	UE	0.97
1/28/88	1695DWOR	SST	10.00	Y	0.13	0.97	42.8	PEP1	2.46
01/28/88	1695DWOR	SST	10.00	Y	0.13	0.97	42.8	PSCY	2.46
01/29/88	1695DWOR	SST	8.00	Y	0.21	1.15	54.4	BG	3.24
01/29/88/	1695DWOR	SST	8.00	Y	0.21	1.15	54.4	VH	3.24
01/29/88	1695DWOR	SST	9.00	Y	0.20	1.15	54.4	BG	5.78
02/02/88	1695DWOR	SCS	0.00		0.00	0.00	0.0	UE	0.00
02/02/88	1695DWOR	SCS	0.00		0.00	0.00	0.0	LJE	0.00
02/02/88	1695DWOR	SCS	0.00		0.00	0.00	0.0	UE	0.00
02/02/88	1695DWOR	SCS	0.00		0.00	0.00	0.0	PICH	0.00
02/03/88	1695DWOR	SST	7.90	Y	0.16	1.28	54.4	VH	6.86
02/03/88	1695DWOR	SST	19.00	Y	0.13	1.11	51.6	VH	6.51
02/03/88	1695DWOR	SST	19.00	Y	0.13	1.11	51.6	PICH	6.51
02/05/88	1695DWOR	SST	6.40	Y	0.22	1.28	54.4	VH	0.00
02/05/88	1695DWOR	SST	8.00	Y	0.15	1.02	38.9	XX	2.12
02/08/88	1695DWOR	SCS	0.00		0.00	0.00	0.0	UE	0.00
02/08/88	1695DWOR	SCS	0.00		0.00	0.00	0.0	UE	0.00
02/08/88	1695DWOR	SCS	0.00		0.00	0.00	0.0	BK	0.00
02/08/88	1695DWOR	SCS	0.00		0.00	0.00	0.0	UE	0.00
02/08/88	1695DWOR	SCS	0.00		0.00	0.00	0.0	BK	0.00
02/08/88	1695DWOR	SCS	0.00		0.00	0.00	0.0	BK	0.06
02/09/88	1695DWOR	SST	8.00	Y	0.24	1.02	38.9	PTRC	2.34
0 2 / 0 9	1695DWOR	SST	12.00	Y	0.12	1.02	38.9	VH	1.77
02/09/88	1695DWOR	SST	12.00	Y	0.12	1.02	38.9	PEP1	1.77
02/09/88	1695DWOR	SST	12.00	Y	0.12	1.02	38.9	TG	1.77
	1695DWOR	SST	6.40	Y	0.22	1.28	54.4	PICH	7.52
02/10/88	1695DWOR	SST	8.00	Y	0.15	1.02	38.9	PEP1	2.12
02/10/88	1695DWOR	SST	5.00	Y	0.30	1.11	51.6	TG	1.23
02/12/88	1695DWOR	SST	9.00	Y	0.06	1.02	38.9	PEP1	32.49
02/12/88	1695DWOR	SST	9.00	Y	0.06	1.02	38.9	PICH	32.49
02/12/88	1695DWOR	SST	9.00	Y	0.06	1.02	38.9	TG	32.49
02/12/88	1695DWOR	SST	9.00	Y	0.06	1.02	38.9	PTRC	32.49
02/12/88	1695DWOR	SST	9.00	Y	0.06	1.02	38.9	BG	32.49
02/17/88	1695DWOR	SST	8.00	Y	0.24	1.02	38.9	PTRC	2.34
02/17/88	1695DWOR	SST	9.00	Y	0.06	1.02	38.9	PEP1	32.49
02/17/88	1695DWOR	SST	9.00	Y	0.06	1.02	38.9	BG	32.49
02/17/88	1695DWOR	SCS	0.00		0.00	0.00	0.0	UE	0.00
02/17/88	1695DWOR	SCS	0.00		0.00	0.00	0.0	BK	0.00
02/18/88	1695DWOR	SST	8.00	Y	0.15	1.02	38.9	PEPI	2.12
02/18/88	1695DWOR	SST	8.00	Y	0.15	1.02	38.9	PTRC	2.12
02/18/88	1695DWOR	SST	8.00	Y	0.15	1.02	38.9	VH	2.12

FISH AND WILDLIFE SERVICE
FISH DISEASE SUMMARY

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
02/18/88	1695DWOR	SST	9.00	Y	0.06	1.02	38.9	VH	32.49
02/19/88	1695DWOR	SST	6.40	Y	0.22	1.28	54.4	XX	7.52
02/19/88	1695DWOR	SST	5.00	Y	0.30	1.11	51.6	PEP1	1.23
02/23/88	1695DWOR	SST	6.40	Y	0.22	1.28	54.4	VH	7.52
02/23/88	1695DWOR	SST	7.00	Y	0.22	1.28	54.4	VH	7.31
02/23/88	1695DWOR	SST	7.00	Y	0.22	1.28	54.4	PICH	7.31
02/23/88	1695DWOR	SST	9.30	Y	0.12	1.28	54.4	VH	7.78
02/23/88	1695DWOR	SST	9.30	Y	0.12	1.28	54.4	PICH	7.78
02/23/88	1695DWOR	SST	9.30	Y	0.12	1.28	54.4	BG	7.78
02/23/88	1695DWOR	SST	9.30	Y	0.12	1.28	54.4	XX	7.78
02/23/88	1695DWOR	SCS	21.80	Y	0.27	0.50	39.5	UE	0.10
02/23/88	1695DWOR	SCS	21.80	Y	0.27	0.50	39.5	PEP1	0.10
02/23/88	1695DWOR	SCS	21.80	Y	0.27	0.50	39.5	PTRY	0.10
02/23/88	1695DWOR	SCS	21.80	Y	0.27	0.50	39.5	BK	0.10
02/26/88	1695DWOR	SST	6.40	Y	0.22	1.28	54.4	PICH	7.52
02/26/88	1695DWOR	SST	6.40	Y	0.22	1.28	54.4	TG	7.52
02/26/88	1695DWOR	SST	6.40	Y	0.22	1.28	54.4	PEP1	7.52
02/26/88	1695DWOR	SST	6.40	Y	0.22	1.28	54.4	BG	7.52
02/26/88	1695DWOR	SST	10.60	Y	0.20	1.28	54.4	PEPI	3.00
02/26/88	1695DWOR	SST	10.60	Y	0.20	1.28	54.4	PSCY	3.00
02/29/88	1695DWOR	SST	22.50	Y	0.08	1.28	38.9	TG	0.39
02/29/88	1695DWOR	SST	8.00	Y	0.22	1.11	51.6	PEPI	4.52
02/29/88	1695DWOR	SST	8.00	Y	0.22	1.11	51.6	VH	4.52
02/29/88	1695DWOR	SST	19.00	Y	0.13	1.11	51.6	VH	6.51
02/29/88	1695DWOR	SST	8.00	Y	0.17	1.02	38.9	VH	3.35
02/29/88	1695DWOR	SST	8.00	Y	0.17	1.02	38.9	PTRC	3.35
03/02/88	1695DWOR	SCS	0.00	F	0.00	0.00	0.0	UE	0.00
03/02/88	1695DWOR	SST	8.00	Y	0.23	1.04	40.4	PTRC	0.61
03/02/88	1695DWOR	SST	8.00	Y	0.23	1.04	40.4	PEP1	0.61
03/02/88	1695DWOR	SST	8.00	Y	0.23	1.04	40.4	VH	0.61
03/02/88	1695DWOR	SST	7.00	Y	0.22	1.04	40.4	VH	0.77
03/02/88	1695DWOR	SST	7.00	Y	0.18	1.04	40.4	PEP1	0.68
03/02/88	1695DWOR	SST	7.00	Y	0.15	1.04	40.4	PTRC	1.28
03/02/88	1695DWOR	SST	7.00	Y	0.15	1.04	40.4	PTRY	1.28
03/02/88	1695DWOR	SST	7.00	Y	0.15	1.04	40.4	VH	1.28
03/03/88	1695DWOR	SST	8.00	Y	0.23	1.04	40.4	PEP1	0.61
03/03/88	1695DWOR	SST	8.00	Y	0.23	1.04	40.4	PTRY	0.61
03/03/88	1695DWOR	SST	7.00	Y	0.22	1.04	40.4	PEPI	0.77
03/03/88	1695DWOR	SST	7.00	Y	0.17	1.38	50.8	PICH	18.01
03/03/88	1695DWOR	SST	7.00	Y	0.17	1.38	50.8	VH	18.01
03/03/88	1695DWOR	SST	5.00	Y	0.32	1.24	49.9	PICH	0.68
03/03/88	1695DWOR	SST	5.00	Y	0.32	1.24	49.9	VH	0.68
03/07/88	1695DWOR	SST	5.60	Y	0.27	1.38	50.8	VH	7.72
03/14/88	1695DWOR	SST	8.00	Y	0.20	1.04	40.4	PTRC	0.43
03/14/88	1695DWOR	SST	8.00	Y	0.20	1.04	40.4	PEPI	0.43
03/14/88	1695DWOR	SST	7.00	Y	0.23	1.04	40.4	PEP1	0.85
03/14/88	1695DWOR	SST	7.00	Y	0.23	1.04	40.4	PTRY	0.85
03/14/88	1695DWOR	SST	6.30	Y	0.23	1.18	50.8	VH	8.37
03/17/88	1695DWOR	SCS	0.00	F	0.00	0.130	0.0	UE	0.00
03/17/88	1695DWOR	SCS	0.00	F	0.00	0.00	0.0	PCOS	0.00

FISH AND WILDLIFE SERVICE
FISH DISEASE SUMMARY

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
03/17/88	1695DWOR	SCS	0.00	F	0.00	0.00	0.0	UE	0.00
03/17/88	1695DWOR	SCS	0.00	F	0.00	0.00	0.0	BK	0.00
03/20/88	1695DWOR	SST	7.00	Y	0.22	1.04	40.4	PTRC	0.77
03/20/88	1695DWOR	SST	7.00	Y	0.22	1.04	40.4	PEP1	0.77
03/20/88	1695DWOR	SST	7.00	Y	0.22	1.04	40.4	PTRY	0.77
03/21/88	1695DWOR	SST	5.10	Y	0.30	1.38	50.8	PEP1	8.70
03/21/88	1695DWOR	SST	5.10	Y	0.30	1.38	50.8	TG	8.70
03/21/88	1695DWOR	SST	6.40	Y	0.23	1.38	50.8	PICH	9.63
03/21/88	1695DWOR	SST	6.40	Y	0.23	1.38	50.8	PCOS	9.63
03/21/88	1695DWOR	SST	6.10	Y	0.20	1.38	50.8	PICH	9.08
03/21/88	1695DWOR	SST	6.10	Y	0.20	1.38	50.8	TG	9.03
03/21/88	1695DWOR	SST	7.00	Y	0.00	0.00	39.5	PICH	0.00
03/22/88	1695DWOR	SST	8.00	Y	0.23	1.04	40.4	PTRC	0.61
03/22/88	1695DWOR	SST	8.00	Y	0.23	1.04	40.4	PTRY	0.61
03/24/88	1695DWOR	SCS	21.90	Y	0.28	0.50	39.5	UE	0.06
03/24/88	1695DWOR	SCS	21.80	Y	0.29	0.50	39.5	UE	0.06
03/24/88	1695DWOR	SCS	21.88	Y	0.29	0.50	39.5	PTRY	0.06
03/24/88	1695DWOR	SCS	21.88	Y	0.29	0.50	39.5	BK	0.06
03/24/88	1695DWOR	SCS	21.50	Y	0.28	0.50	39.5	UE	0.04
03/24/88	1695DWOR	SCS	21.50	Y	0.28	0.50	39.5	PEP1	0.04
03/24/88	1695DWOR	SCS	21.50	Y	0.28	0.50	39.5	PTRY	0.04
03/24/88	1695DWOR	SCS	21.50	Y	0.28	0.50	39.5	BK	0.04
03/24/88	1695DWOR	SCS	21.80	Y	0.27	0.50	39.5	UE	0.08
03/24/88	1695DWOR	SCS	21.80	Y	0.27	0.50	39.5	BK	0.08
03/24/88	1695DWOR	SCS	23.20	Y	0.25	0.50	39.5	UE	0.06
03/24/88	1695DWOR	SCS	23.20	Y	0.25	0.50	39.5	BK	0.06
03/24/88	1695DWOR	SCS	23.60	Y	0.28	5.00	39.5	UE	0.03
03/24/88	1695DWOR	SCS	23.60	Y	0.28	0.50	39.5	PTRY	0.03
03/24/88	1695DWOR	SCS	23.60	Y	0.28	0.50	39.5	BK	0.03
03/24/88	1695DWOR	SCS	24.40	Y	0.23	0.50	39.5	PEPI	0.21
03/24/88	1695DWOR	SCS	24.40	Y	0.23	0.50	39.5	UE	0.21
03/24/88	1695DWOR	SCS	24.40	Y	0.23	0.50	39.5	PTRY	0.21
03/24/88	1695DWOR	SCS	24.40	Y	0.23	0.50	39.5	BK	0.21
03/24/88	1695DWOR	SCS	23.30	Y	0.50	0.50	39.5	UE	0.03
03/24/88	1695DWOR	SCS	23.30	Y	0.50	0.50	39.5	PEP1	0.03
03/24/88	1695DWOR	SCS	23.30	Y	0.50	0.50	39.5	PTRY	0.03
03/24/88	1695DWOR	SCS	23.30	Y	0.50	0.50	39.5	BK	0.03
03/24/88	1695DWOR	SCS	23.30	Y	0.29	0.50	39.5	UE	0.06
03/24/88	1695DWOR	SCS	23.30	Y	0.29	0.50	39.5	PTRY	0.06
03/24/88	1695DWOR	SCS	23.30	Y	0.29	0.50	39.5	BK	0.06
03/28/88	1695DWOR	SST	7.00	Y	0.18	1.04	40.4	PTRC	0.68
03/28/88	1695DWOR	SST	7.00	Y	0.18	1.04	40.4	PTRY	0.68
03/31/88	1695DWOR	SST	6.40	Y	0.21	1.38	50.8	PEP1	9.35
04/04/88	1695DWOR	SCS	1000.00	S	0.00	0.00	0.0	UE	0.00
04/07/88	1695DWOR	SST	6.30	Y	0.21	1.25	42.1	XX	0.00
05/25/88	1695DWOR	SCS	85.40	F	0.18	0.34	50.9	UE	0.00
05/27/88	1695DWOR	SCS	85.40	F	0.18	0.34	0.0	UE	0.00
05/27/88	1695DWOR	SCS	85.40	F	0.18	0.34	0.0	BK	0.00
05/27/88	1695DWOR	SCS	85.40	F	0.18	0.34	0.0	UE	0.00
05/27/88	1695DWOR	SCS	85.40	F	0.18	0.34	0.0	BK	0.00

FISH AND WILDLIFE SERVICE
FISH DISEASE SUMMARY

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
05/31/88	1695DWOR	SST	500.00	F	0.20	0.50	56.0	XX	0.00
06/13/88	1695DWOR	SCS	0.00	F	0.00	0.00	0.0	UE	0.00
06/13/88	1695DWOR	SCS	0.00	F	0.00	0.00	0.0	BK	0.00
07/05/88	1695DWOR	SCS	76.10	F	0.24	0.40	51.6	XX	0.00
07/13/88	1695DWOR	SST	200.00	F	0.00	0.00	0.0	PICH	0.00
07/20/88	1695DWOR	SCS	0.00	F	0.00	0.00	0.0	PICH	0.25
07/21/88	1695DWOR	SCS	0.00		0.00	0.00	0.0	PICH	0.00
07/29/88	1695DWOR	SCS	0.00	F	0.00	0.00	0.0	PICH	0.00
08/03/88	1695DWOR	SCS	0.00	F	0.00	0.00	0.0	PEP1	0 .00
08/03/88	1695DWOR	SCS	0.00	F	0.00	0.00	0.0	BK	0.00
08/08/88	1695DWOR	SST	200.00	F	0.00	0.00	45.0	PICH	0.00
08/09/88	1695DWOR	SCS	41.90	F	0.20	0.50	56.0	PICH	0.50
08/09/88	1695DWOR	SCS	43.40	F	0.09	0.18	55.0	PICH	7.82
08/12/88	1695DWOR	SST	66.90	F	0.06	0.21	52.7	PICH	23.77
08/14/88	1695DWOR	SCS	43.60	F	0.35	0.18	52.7	PICH	6.90
08/14/88	1695DWOR	SST	111.70	F	0.08	0.22	52.7	PICH	16.70
08/14/88	1695DWOR	SST	111.70	F	0.08	0.22	52.7	VH	16.70
08/17/88	1695DWOR	SST	115.30	F	0.09	0.22	52.7	VH	14.34
08/25/88	1695DWOR	SCS	43.40	F	0.09	0.18	52.7	PICH	7.82
08/25/88	1695DWOR	SST	70.50	F	0.08	0.21	52.7	XX	16.56
08/25/88	1695DWOR	SST	70.60	F	0.06	0.21	52.7	XX	16.74
08/31/88	1695DWOR	SCS	43.40	F	0.09	0.18	52.7	PICH	7.05
08/31/88	1695DWOR	SST	65.10	F	0.05	0.21	52.7	XX	32.85
09/13/88	1695DWOR	SST	37.80	F	0.09	0.27	52.7	PICH	12.05
09/13/88	1695DWOR	SST	37.80	F	0.09	0.27	52.7	VH	12.05
09/13/88	1695DWOR	SST	38.40	F	0.09	0.27	52.7	VH	11.78
09/19/88	1695DWOR	SCS	32.40	F	0.22	0.60	52.7	UE	0.29
09/19/88	1695DWOR	SCS	32.40	F	0.21	0.60	52.7	BK	0.50
09/19/88	1695DWOR	SCS	32.40	F	0.21	0.60	52.7	PEP1	0.50
09/19/88	1695DWOR	SCS	32.40	F	0.21	0.60	52.7	UE	0.50
09/19/88	1695DWOR	SCS	31.30	F	0.20	0.60	52.7	UE	0.08
09/19/88	1695DWOR	SCS	34.50	F	0.25	0.60	52.7	BK	0.95
09/19/88	1695DWOR	SCS	34.50	F	0.24	0.60	52.7	BK	1.13
09/19/88	1695DWOR	SCS	34.50	F	0.24	0.60	52.7	UE	1.13
09/19/88	1695DWOR	SCS	35.90	F	0.14	0.60	52.7	BK	1.70
09/19/88	1695DWOR	SCS	35.90	F	0.14	0.60	52.7	UE	1.70
09/22/88	1695DWOR	SCS	32.48	F	0.10	0.15	52.7	UE	0 .00
09/22/88	1695DWOR	SCS	32.48	F	0.10	0.19	52.7	BK	0.00
09/22/88	1695DWOR	SCS	32.20	F	0.11	0.19	0.0	UE	1.51
09/22/88	1695DWOR	SCS	32.20	F	0.11	0.19	52.7	BK	1.51
09/26/88	1695DWOR	SCS	33.34	F	0.19	0.40	52.7	BK	0.87
09/28/88	1695DWOR	SCS	46.70	F	0.21	0.50	52.7	BK	0.45
09/31/88	1695DWOR	SCS	34.50	F	0.25	0.60	52.7	BK	0.95
10/03/88	1695DWOR	SST	12.30	Y	0.07	0.3[illegible]	53.7	VH	3.40
11/04/88	1695DWOR	SST	24.76	Y	0.09	0.4[illegible]	50.8	TG	0.38
11/14/88	1695DWOR	SCS	928.00	F	0.02	0.0[illegible]	49.3	UE	3.99
11/14/88	1695DWOR	SST	18.62	Y	0.16	0.4	50.8	TG	3.51
11/14/88	1695DWOR	SST	18.62	Y	0.16	0.4	50.8	PEPI	3.51
11/14/88	1695DWOR	SST	18.62	Y	0.16	0.4[illegible]	50.8	PTRY	3.51
11/14/88	1695DWOR	SST	18.62	Y	0.16	0.[illegible]	[illegible]	H	3.51

FISH AND WILDLIFE SERVICE
FISH DISEASE SUMMARY

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
11/14/88	1695DWOR	SCS	24.16	Y	0.24	0.70	49.1	PEP1	0.29
11/14/88	1695DWOR	SCS	24.16	Y	0.24	0.70	49.1	PSCY	0.29
11/14/88	1695DWOR	SCS	24.16	Y	0.24	0.70	49.1	PTRY	0.29
11/28/88	1695DWOR	SCS	22.56	Y	0.23	0.70	49.1	UE	0.11
11/28/88	1695DWOR	SCS	22.56	Y	0.23	0.70	49.1	PSCY	0.11
11/28/88	1695DWOR	SCS	22.56	Y	0.23	0.70	49.1	PTRY	0.11
11/28/88	1695DWOR	SCS	22.71	Y	0.25	0.70	49.1	UE	0.67
11/28/88	1695DWOR	SCS	22.71	Y	0.25	0.70	49.1	PTRC	0.67
11/28/88	1695DWOR	SCS	25.19	F	0.21	0.70	49.1	UE	0.15
11/28/88	1695DWOR	SCS	25.19	F	0.21	0.70	49.1	PSCY	0.15
11/28/88	1695DWOR	SCS	25.19	F	0.21	0.70	49.1	PEP1	0.15
12/08/88	1695DWOR	SST	9.03	Y	0.16	6.00	53.8	XX	0.18
12/08/88	1695DWOR	SST	8.30	Y	0.12	0.70	53.9	PTRY	0.20
12/29/88	1695DWOR	SST	9.03	Y	0.16	0.60	53.8	UE	0.18
12/29/88	1695DWOR	SST	9.03	Y	0.16	0.60	53.8	PSCY	0.18
12/29/88	1695DWOR	SST	8.30	Y	0.12	0.70	53.9	UE	0.20
12/30/88	1695DWOR	SST	13.45	Y	0.18	0.60	53.8	PSCY	1.52
12/30/88	1695DWOR	SST	13.45	Y	0.18	0.60	53.8	PEP1	1.52
12/30/88	1695DWOR	SCS	23.60	Y	0.22	0.70	43.3	PEP1	1.64
12/30/88	1695DWOR	SCS	23.60	Y	0.22	0.70	43.3	PSCY	1.64

E A G L E C R E E K N A T I O N A L F I S H H A T C H E R Y

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
01/13/88	4398EGCK	COS	13.50	Y	0.48	1.43	34.0	BW	0.20
02/10/88	4398EGCK	COS	24.00	Y	0.37	1.10	44.0	BW	0.20
04/21/88	4398EGCK	COS	15.00	Y	0.42	1.25	42.0	BK	0.10
04/29/88	4398EGCK	WST	0.00	B	0.00	0.00	0.0	VH	0.00
05/13/88	4398EGCK	COS	550.00	F	0.18	0.76	45.0	BW	0.20
05/31/88	4398EGCK	COS	1200.00	F	0.19	0.33	46.0	BW	10.00
06/09/88	4398EGCK	WST	2100.00	F	0.14	0.30	46.0	BW	0.00
06/09/88	4398EGCK	WST	2100.00	S	0.14	0.30	46.0	UW	0.00
09/09/88	4398EGCK	COS	72.00	F	0.07	0.20	59.0	BW	2.00
09/09/88	4398EGCK	COS	49.00	F	0.34	1.01	59.0	BW	0.10
11/15/88	4398EGCK	COS	31.00	F	0.11	0.34	45.0	BK	0.70
11/15/88	4398EGCK	COS	25.00	Y	0.53	1.57	45.0	BK	0.10
11/15/88	4398EGCK	WST	21.00	Y	0.37	1.11	45.0	BK	0.10
11/15/88	4398EGCK	WST	21.00	Y	0.37	1.11	45.0	PEP1	0.10
11/15/88	4398EGCK	WST	21.00	Y	0.37	1.11	45.0	PSCY	0.10
11/15/88	4398EGCK	COS	24.00	Y	0.46	1.36	45.0	BK	0.10
11/15/88	4398EGCK	COS	0.00	B	0.00	0.00	0.0	BK	0.00
11/15/88	4398EGCK	COS	0.00	B	0.00	0.00	0.0	SC	0.00
12/13/88	4398EGCK	WST	19.00	E	0.24	0.58	45.0	PEP1	0.25
12/13/88	4398EGCK	WST	19.00	Y	0.24	0.58	45.0	PSCY	0.25
12/13/88	4398EGCK	WST	19.00	Y	0.24	0.58	45.0	TG	0.25

E N T I A T N A T I O N A L F I S H H A T C H E R Y

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
01/19/88	5399ENT	SCS	23.00	Y	0.19	0.83	35.0	PEP1	-1.00
01/19/88	5399ENT	SCS	2.00	Y	0.19	0.83	0.0	BA	-1.00
01/19/88	5399ENT	SCS	2.00	Y	0.19	0.83	0.0	VN	-1.00
01/19/88	5399ENT	SCS	650.00	F	0.25	0.89	48.0	UW	-1.00
01/19/88	5399ENT	SCS	650.00	F	0.25	0.89	0.0	VN	-1.00
04/11/88	5399ENT	SCS	163.00	F	0.26	1.00	48.0	PCOS	0.09
04/11/88	5399ENT	SCS	22.80	Y	0.19	0.72	48.0	BK	1.20
04/11/88	5399ENT	SCS	22.80	Y	0.19	0.72	0.0	PEP1	1.20
04/11/88	5399ENT	SCS	22.80	Y	0.19	0.72	0.0	PCOS	1.20
04/11/88	5399ENT	SCS	22.80	Y	0.19	0.72	0.0	VH	1.20
05/24/88	5399ENT	SCS	72.00	F	0.09	0.28	46.0	BK	0.50
05/24/88	5399ENT	SCS	72.00	F	0.09	0.28	46.0	PCOS	0.50
06/28/88	5399ENT	SCS	51.00	F	0.10	0.40	50.0	BK	0.13
07/27/88	5399ENT	SCS	36.00	F	0.13	0.73	56.0	SM	0.01
07/27/88	5399ENT	SCS	36.00	F	0.13	0.73	56.0	BK	0.01
08/25/88	5399ENT	SCS	0.05	B	0.00	0.00	56.0	VN	0.00
08/25/88	5399ENT	SCS	0.05	B	0.00	0.00	56.0	VH	0.00
08/25/88	5399ENT	SCS	0.05	B	0.00	0.00	56.0	BK	0.00
11/01/88	5399ENT	SCS	26.80	F	0.23	0.88	45.0	PTRC	0.90
11/01/88	5399ENT	SCS	26.80	F	0.23	0.88	45.0	PCOS	0.90
11/01/88	5399ENT	SCS	26.80	F	0.23	0.88	45.0	PEP1	0.90
11/01/88	5399ENT	SCS	25.90	F	0.19	0.72	45.0	BK	1.52
12/15/88	5399ENT	SCS	26.70	F	0.23	0.88	34.0	PCOS	0.10
12/15/88	5399ENT	SCS	26.70	F	0.23	0.88	34.0	PEP1	0.10
12/15/88	5399ENT	SCS	26.70	F	0.18	0.68	34.0	PCOS	1.05
12/15/88	5399ENT	SCS	26.70	F	0.18	0.68	34.0	PEP1	1.05
12/15/88	5399ENT	SCS	909.00	F	0.28	1.26	48.0	UW	1.00

HAGERMAN NATIONAL FISH HATCHERY

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
05/26/88	1695HGMN	RBT	10.60	Y	0.40	0.60	58.0	xx	0.00
06/18/88	1695HGMN	SST	800.00	F	0.00	0.00	58.0	xx	0.00
07/05/88	1695HGMN	SST	1335.00	E	0.00	0.00	58.0	xx	0.00
07/05/88	1695HGMN	SST	0.00	F	0.43	0.66	58.0	xx	0.00
07/05/88	1695HGMN	SST	250.00	F	0.43	0.66	58.0	xx	0.00
08/31/88	1695HGMN	SST	0.00	F	0.00	0.00	0.0	xx	0.00

KOOSKIA NATIONAL FISH HATCHERY

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
01/13/88	1695KOOS	SCS	23.80	Y	0.00	0.00	38.0	UE	5.00
02/08/88	1695KOOS	SCS	0.00	Y	0.00	0.00	0.0	UE	0.00
02/08/88	1695KOOS	SCS	0.00	Y	0.00	0.00	0.0	PEP1	0.00
02/08/88	1695KOOS	SCS	0.00	Y	0.00	0.00	0.0	BK	0.00
02/08/88	1695KOOS	SCS	0.00		0.00	0.00	0.0	BK	0.00
02/08/88	1695KOOS	SCS	0.00		0.00	0.00	0.0	UE	0.00
02/08/88	1695KOOS	SCS	0.00		0.00	0.00	0.0	BK	0.00
04/05/88	1695KOOS	SCS	1000.00	S	0.00	0.00	0.0	BG	0.00
04/06/88	1695KOOS	SCS	250.00	F	0.00	0.00	0.0	BG	0.00
04/14/88	1695KOOS	SCS	0.00	F	0.00	0.00	48.0	BG	0.00
04/21/88	1695KOOS	SCS	0.00	F	0.00	0.00	48.0	BG	0.00
06/06/88	1695KOOS	SCS	95.00	F	0.14	1.80	48.5	UE	0.00
06/06/88	1695KOOS	SCS	95.00	F	0.14	1.80	48.5	BK	0.00
06/08/88	1695KOOS	SCS	73.30	F	0.21	0.40	51.6	UE	0.01
06/08/88	1695KOOS	SCS	73.30	F	0.21	0.40	51.6	BK	0.01
06/13/88	1695KOOS	SCS	95.00	F	0.14	2.80	48.5	BK	0.00
06/29/88	1695KOOS	SCS	85.00	F	0.11	1.20	48.5	PICH	0.00
06/29/88	1695KOOS	SCS	85.00	F	0.11	1.20	48.5	BC	0.00
07/05/88	1695KOOS	SCS	85.00	F	0.19	2.10	52.0	PICH	0.01
08/14/88	1695KOOS	SCS	0.00	F	0.13	0.71	0.0	BK	0.00
09/07/88	1695KOOS	SCS	0.00		0.00	0.00	0.0	UE	0.00
09/15/88	1695KOOS	SCS	0.00	Y	0.00	0.00	0.0	PICH	0.00
09/15/88	1695KOOS	SCS	0.00	Y	0.00	0.00	0.0	UE	0.00
09/23/88	1695KOOS	SCS	0.00	Y	0.00	0.00	0.0	UE	0.00
10/05/88	1695KOOS	SCS	0.00	Y	0.00	0.00	0.0	UE	0.00
10/05/88	1695KOOS	SCS	0.00	Y	0.00	0.00	0.0	PEP1	0.00
10/05/88	1695KOOS	SCS	0.00	Y	0.00	0.00	0.0	UE	0.00
10/05/88	1695KOOS	SCS	0.00	Y	0.00	0.00	0.0	PEP1	0.22
11/09/88	1695KOOS	SCS	0.00	Y	0.00	0.79	0.0	PEPI	0.00
11/09/88	1695KOOS	SCS	0.00	Y	0.00	0.00	0.0	PSCY	0.00
11/09/88	1695KOOS	SCS	0.00	Y	0.00	0.00	0.0	UE	0.00
11/09/88	1695KOOS	SCS	0.00	Y	0.00	0.00	0.0	PTRC	0.00

LEAVENWORTH NATIONAL FISW HATCHERY

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
01/18/88	5399LVNW	SCS	19.30	Y	0.11	2.21	34.0	PEPI	-1.00
01/18/88	5399LVNW	SST	40.00	F	0.06	0.55	34.0	VN	-1.00
01/18/88	5399LVNW	SST	a.20	Y	0.09	1.99	34.0	VN	-1.00
01/18/88	5399LVNW	SST	30.00	F	0.07	0.56	34.0	PEP1	-1.00
01/18/88	5399LVNW	SST	23.00	Y	0.14	0.55	34.0	PTRC	-1.00
01/18/88	5399LVNW	SST	a.20	Y	0.09	1.99	34.0	TG	-1.00
01/19/88	5399LVNW	SCS	19.30	Y	0.10	2.68	34.0	BK	0.01
01/19/88	5399LVNW	SCS	19.30	Y	0.10	2.68	34.0	PEP1	0.01
01/19/88	5399LVNW	SST	87.00	F	0.34	1.02	48.0	XX	-1.00
01/19/88	5399LVNW	SST	87.00	F	0.34	1.02	48.0	VN	-1.00
01/19/88	5399LVNW	SCS	500.00	F	0.25	0.74	48.0	UW	0.02
01/19/88	5399LVNW	SCS	500.00	F	0.25	0.74	46.8	VN	0.02
03/08/88	5399LVNW	SCS	19.00	Y	0.08	2.09	35.0	PCOS	0.00
03/08/88	5399LVNW	SCS	19.00	Y	0.00	2.09	0.0	PEP1	0.00
04/12/88	5399LVNW	SCS	19.00	Y	0.00	0.00	46.0	BK	0.00
04/12/88	5399LVNW	SCS	90.00	F	0.00	0.00	0.0	XX	0.00
04/12/88	5399LVNW	WST	a.00	Y	0.00	0.00	0.0	BK	0.00
04/12/88	5399LVNW	WST	70.00	F	0.00	0.00	0.0	BK	0.00
05/04/88	5399LVNW	SST	26.90	F	0.05	1.17	41.0	TG	0.00
05/04/88	5399LVNW	SCS	95.00	F	0.23	1.20	41.0	XX	0.00
05/05/88	5399LVNW	SST	0.10	B	0.00	0.00	48.0	VN	0.00
05/05/88	5399LVNW	SST	0.10	B	0.00	0.00	48.0	BK	0.00
05/05/88	5399LVNW	SST	0.10	B	0.00	0.00	48.0	SC	0.00
05/05/88	5399LVNW	SST	0.10	B	0.00	0.00	46.0	VH	0.00
05/05/88	5399LVNW	SST	0.10	B	0.00	0.00	48.0	VP	0 .00
05/25/88	5399LVNW	SCS	79.00	F	0.08	0.29	46.0	XX	0.00
05/25/88	5399LVNW	SST	22.00	Y	0.06	1.40	46.0	TG	0.00
06/28/88	5399LVNW	SCS	17.50	Y	0.06	1.23	53.0	TG	0.00
06/28/88	5399LVNW	SCS	17.50	Y	0.06	1.23	53.0	PEP1	0.00
06/28/88	5399LVNW	SCS	57.40	F	0.05	0.78	50.0	BK	0.00
08/15/88	5399LVNW	SCS	0.05	B	0.00	0.00	55.0	VN	0.00
08/22/88	5399LVNW	SCS	41.00	F	0.07	1.13	52.0	PICH	0.00
08/22/88	5399LVNW	SST	15.00	Y	0.07	1.10	57.0	PICH	0.00
11/17/88	5399LvNw	SCS	1100.00	F	0.21	0.70	51.0	UW	3.00
12/16/88	5399LVNW	SCS	25.40	F	0.13	2.46	38.0	PEP1	0.00
12/16/88	5399LVNW	SCS	25.30	F	0.10	0.99	38.0	PEP1	0.02
12/16/88	5399LVNW	WST	205.00	F	0.21	0.76	49.6	XX	0.00

LITTLE WHITE SALMON NATIONAL FISH HATCHERY

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
03/17/88	5399LWS	SCS	la.00	Y	0.35	1.27	41.9	BK	0.20
04/15/88	5399LWS	FCS	580.00	F	0.48	2.71	46.0	BW	0.20
06/07/88	5399Lws	SCS	16.00	Y	0.31	1.30	42.8	PSCY	0 .00
06/07/88	5399Lws	SCS	16.00	Y	0.31	1.30	42.8	BK	0.00
07/01/88	5399LWS	SCS	50.00	F	0.33	1.20	45.5	BK	0.50
07/25/88	5399LWS	SCS	38.00	F	0.40	1.45	46.4	BK	2.00
09/02/88	5399LWS	SCS	22.00	Y	0.28	1.02	48.2	BK	1.00
09/19/88	5399LWS	SCS	0.05	B	0.00	0.00	0.0	BK	0.00
09/19/88	5399Lws	SCS	0.05	B	0.00	0.00	46.0	BF	0.00
09/19/88	5399Lws	SCS	0.05	B	0.00	0.00	46.0	VH	0.00
09/19/88	5399Lws	SCS	0.05	B	0.00	0.00	46.0	SC	0 .00
10/12/88	5399LWS	SCS	21.00	Y	0.28	1.01	44.6	PEP1	2.40
10/12/88	5399Lws	SCS	21.00	Y	0.28	1.01	44.6	PSCY	2.40
10/12/88	5399Lws	SCS	21.00	Y	0.28	1.01	44.6	BK	2.40
10/26/88	5399Lws	COS	0.00	B	0.00	0.00	48.0	SC	0.00
10/26/88	5399LWS	COS	0.00	B	0.00	0.00	48.0	VH	0.00
11/03/88	5399LWS	SCS	23.60	Y	0.27	0.97	45.0	BK	0.80
11/16/88	5399Lws	URB	0.00	B	0.00	0.00	0.0	VH	0.00
11/16/88	5399LWS	URB	0.00	B	0.00	0.00	0.0	SC	0.00
12/01/88	5399LWS	SCS	20.50	Y	0.27	0.98	43.0	VN	0.35
12/01/88	5399LWS	SCS	20.50	Y	0.27	0.98	43.0	BK	0.35
12/05/88	5399LWS	SCS	20.50	Y	0.00	0.00	43.0	PEP1	0.35
12/05/88	5399LWS	SCS	20.50	Y	0.00	0.00	43.0	BK	0.35
12/05/88	5399LWS	COS	21.00	Y	0.45	1.40	42.0	BW	0.25
12/30/88	5399LWS	SCS	19.90	Y	0.29	1.07	42.0	PEP1	0.39
12/30/88	5399Lws	SCS	19.90	Y	0.29	1.07	42.0	PSCY	0.39
12/30/88	5399LWS	SCS	19.90	Y	0.29	1.07	42.0	BK	0.39

SPRING CREEK NATIONAL FISH HATCHERY

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
01/06/88	5399SPCK	FCS	831.00	F	0.01	0.05	48.0	BR	0 . 0 0
02/22/88	5399SPCK	FCS	205.00	F	0.02	0.13	48.0	BR	0.00
03/21/88	5399SPCK	FCS	135.00	F	0.02	0.18	49.0	BR	0.00
03/22/88	5399SPCK	SCS	21.00	Y	0.93	1.15	42.0	PICH	0.30
03/22/88	5399SPCK	SCS	21.00	Y	0.93	1.15	42.0	VN	0.30
05/17/88	5399SPCK	FCS	36.00	F	0.23	1.21	48.0	BR	0.80
06/07/88	5399SPCK	FCS	90.00	F	0.28	2.38	48.2	BK	0.00
10/20/88	5399SPCK	FCS	0.05	B	0.00	0.00	0.0	VH	0.00
10/20/88	5399SPCK	FCS	0.05	B	0.00	0.00	0.0	BK	0.00
10/28/88	5399spcK	Fcs	0.05	B	0 .00	0.00	0.0	SC	0.00
12/19/88	5399SPCK	FCS	1095.00	F	0.06	0.66	41.0	UW	1.00
12/19/88	5399SPCK	FCS	1095.00	s	0.06	0.66	41.0	FS	1.00

W A R M S P R I N G S N A T I O N A L F I S H H A T C H E R Y

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
01/05/88	4398WMSP	SCS	900.00	F	0.55	2.14	32.0	BG	0.10
01/05/88	4398WMSP	SCS	900.00	F	0.55	2.14	32.0	BW	0.00
01/05/88	4398WMSP	SCS	900.00	F	0.55	2.14	32.0	UW	0.10
02/19/88	4398WMSP	SCS	21.00	Y	0.31	1.17	36.0	TN	0.15
04/20/88	4398WMSP	RBT	3.50	Y	0.17	1.23	45.0	PTRC	0.07
04/20/88	4398WMSP	RBT	3.50	Y	0.17	1.23	45.0	PEP1	0.07
04/20/88	439aWMSP	RBT	3.50	Y	0.17	1.23	45.0	TG	0.07
04/20/88	4398WMSP	RBT	3.50	Y	0.17	1.23	45.0	SH	0.07
04/20/88	4398WMSP	RBT	3.50	Y	0.17	1.23	45.0	SS	0.07
04/29/88	4398WMSP	SCS	13.50	Y	0.35	1.32	50.0	BK	0.06
05/23/88	4398WMSP	RBT	274.00	F	0.56	1.45	52.0	VH	4.00
05/23/88	439aWMSP	RBT	274.00	F	0.56	1.45	52.0	MB	4.00
05/29/88	4398WMSP	RBT	7.00	Y	0.11	0.56	54.0	MB	0.90
05/29/88	4398WMSP	RBT	7.00	Y	0.11	0.56	54.0	VH	0.90
06/08/88	4398WMSP	RBT	4.00	Y	0.15	1.11	45.0	TG	0.00
06/08/88	4398WMSP	SCS	15.00	Y	0.32	1.23	49.0	BK	0.00
07/01/88	4398WMSP	SCS	36.00	F	0.18	0.68	60.0	TN	0.08
07/01/88	439aWMSP	SCS	36.00	F	0.18	0.68	60.0	PICH	0.08
07/01/88	4398WMSP	SCS	36.00	F	0.18	0.68	60.0	MB	0.08
07/25/88	4398WMSP	RBT	260.00	F	0.22	0.87	60.0	BG	2.00
08/18/88	4398WMSP	SCS	0.12	B	0.00	0.00	51.0	CS	2.00
08/18/88	4398WMSP	RBT	130.00	F	0.05	0.18	56.0	TS	0.08
08/18/88	4398WMSP	RBT	130.00	F	0.05	0.18	56.0	PICH	0.08
08/18/88	4398WMSP	SCS	17.00	Y	0.37	0.80	56.0	TS	0.40
08/18/88	4398WMSP	SCS	17.00	Y	0.37	0.80	56.0	TN	0.40
08/18/88	4398WMSP	scs	17.00	Y	0.37	0.80	56.0	TC	0.40
09/05/88	4398WMSP	SCS	20.00	Y	0.26	0.83	50.0	TC	0.13
09/05/88	4398WMSP	SCS	20.00	Y	0.26	0.83	50.0	TS	0.13
09/05/88	4398WMSP	SCS	20.00	Y	0.26	0.83	50.0	TN	0.13
10/14/88	4398WMSP	SCS	0.00	B	0.00	0.00	0.0	BF	0.00
10/14/88	4398WMSP	SCS	0.00	B	0.00	0.00	0.0	SC	0.00
10/14/88	4398WMSP	SCS	0.00	B	0.00	0.00	0.0	BK	0.00
10/14/88	439aWMSP	SCS	0.00	B	0.00	0.00	0.0	VH	0.00
10/19/88	4398WMSP	RBT	la.00	Y	0.11	0.34	50.0	PEP1	0.40
10/19/88	4398WMSP	RBT	18.00	Y	0.11	0.34	50.0	PSCY	0.40
10/19/88	4398WMSP	RBT	18.00	Y	0.11	0.34	50.0	TG	0.40
10/19/88	439aWMSP	SCS	20.00	Y	0.26	0.84	50.0	TS	0.60
10/19/88	439aWMSP	SCS	20.00	Y	0.26	0.84	50.0	TN	0.60
10/19/88	4398WMSP	SCS	20.00	Y	0.26	0.84	50.0	TC	0.60
10/20/88	4398WMSP	WST	0.00	B	0.00	0.00	0.0	XX	0.00
11/16/88	439aWMSP	SCS	20.00	Y	0.26	1.00	50.0	TC	0.50
11/16/88	4398WMSP	SCS	20.00	Y	0.26	1.00	50.0	TN	0.50
11/16/88	4398WMSP	SCS	20.00	Y	0.26	1.00	50.0	TS	0.50
11/16/88	4398WMSP	RBT	20.00	Y	0.10	0.39	50.0	PEPI	0.01
12/13/88	439aWMSP	RBT	16.00	F	0.12	0.46	40.0	PEP1	0.02
12/13/88	4398WMSP	SCS	20.60	Y	0.35	1.36	40.0	TN	0.50
12/13/88	4398WMSP	SCS	20.60	Y	0.35	1.36	40.0	PEPI	0.50
12/13/88	4398WMSP	scs	10.20	Y	0.16	0.62	40.0	PEP1	0.50
12/13/88	4398WMSP	SCS	10.20	Y	0.16	0.62	40.0	TN	0.50

WILLARD NATIONAL FISH HATCHERY

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
03/21/88	5399WILL	COS	24.00	Y	0.40	1.25	42.8	BW	0.50
04/27/88	5399WILL	COS	20.00	Y	0.41	1.28	43.0	BK	0.36
04/27/88	5399WILL	COS	20.00	Y	0.41	1.28	43.0	BW	0.36
04/29/88	5399WILL	COS	20.00	Y	0.41	1.28	43.0	BW	0.80
07/25/88	5399WILL	COS	47.70	F	0.26	0.81	44.0	BW	1.00
09/02/88	5399WILL	COS	26.00	F	0.39	1.20	46.4	BW	0.40
10/14/88	5399WILL	COS	22.80	Y	0.45	1.40	42.8	BW	0.20
11/03/88	5399WILL	COS	21.50	Y	0.44	1.37	42.0	BW	0.20
12/30/88	5399WILL	COS	21.00	Y	0.45	1.39	40.0	BW	0.21

WINTHROP NATIONAL FISH HATCHERY

DATE	LOCATION	SPE	FISH/LB	AGE	DEN-IND	FLOW-IND	TEMP	DIS	LOSS/MO
01/20/88	5399WNRP	SCS	22.40	Y	0.25	0.75	36.0	FS	0.01
01/20/88	5399WNRP	SCS	22.40	Y	0.25	0.75	0.0	PEPI	0.01
01/20/88	5399WNRP	SCS	22.40	Y	0.25	0.75	0.0	BK	0.01
01/20/88	5399WNRP	SCS	22.40	Y	0.25	0.75	0.0	VN	0.01
01/20/88	5399WNRP	SCS	600.00	F	0.25	1.11	48.0	UW	0.01
01/20/88	5399WNRP	SCS	600.00	F	0.25	1.11	0.0	BW	0.01
01/20/88	5399WNRP	SCS	24.30	Y	0.18	1.31	36.0	VN	0.00
01/20/88	5399WNRP	RBT	9.30	Y	0.09	0.69	36.0	TG	0.00
01/20/88	5399WNRP	RBT	9.30	Y	0.09	0.69	0.0	PEPI	0.00
01/20/88	5399WNRP	CUT	122.00	F	0.08	0.53	36.0	BF	0.00
05/24/88	5399WNRP	BKT	160.00	F	0.15	0.48	49.0	XX	0.00
05/24/88	5399WNRP	RBT	110.00	F	0.17	1.27	46.0	BAGD	0.50
06/23/88	5399WNRP	BKT	84.00	F	0.35	1.40	48.0	BF	6.00
07/27/88	5399WNRP	RBT	32.60	F	0.17	1.04	55.0	PTRC	1.20
07/27/88	5399WNRP	BKT	48.50	F	0.40	0.81	49.0	BF	9.90
07/27/88	5399WNRP	BKT	48.50	F	0.14	1.01	49.0	BF	1.60
08/29/88	5399WNRP	RBT	27.00	F	0.14	1.24	52.0	BG	15.00
08/29/88	5399WNRP	SCS	0.05	A	0.00	0.00	54.0	VH	0.00
08/29/88	5399WNRP	SCS	0.05	B	0.00	0.00	54.0	BK	0.00
08/29/88	5399WNRP	SCS	0.05	B	0.00	0.00	54.3	SC	0.00
08/29/88	5399WNRP	SCS	0.05	B	0.00	0.00	54.0	SC	0.00
09/01/88	5399WNRP	BKT	26.00	F	0.30	3.10	52.0	BG	4.60
09/01/88	5399WNRP	BKT	26.00	F	0.30	3.10	52.0	BF	4.60
09/01/88	5399WNRP	RBT	27.00	F	0.14	1.24	52.0	BG	15.00
09/01/88	5399WNRP	RBT	27.00	F	0.14	1.24	52.0	BK	15.00
09/01/88	5399WNRP	RBT	27.00	F	0.14	1.24	52.0	SC	15.00
09/01/88	5399WNRP	RBT	27.00	F	0.14	1.24	52.0	VH	15.00
10/08/88	5399WNRP	CTT	800.00	F	0.10	0.54	50.0	COST	0.08
11/01/88	5399WNRP	CTT	450.90	F	0.14	0.45	48.0	COST	1.20
12/15/88	5399WNRP	SCS	18.40	Y	0.24	0.81	35	PEPI	0.30
12/15/88	5399WNRP	CUT	240.00	F	0.05	0.34	48.0	XX	0.60
12/15/88	5399WNRP	SCS	1107.00	S	0.26	1.42	48.0	3:	0.00

DEFINITIONS/CODING

DISEASE

Definition-Coded value for a disease.
Coding-

X.X = No Disease Observed

Bacteria

BR - Yersinia Ruckeri
BK = R. Salmoninarum
BF - A. Salmonicida
BG = Bacterial Gill Disease
BC - Flexibacter Columnaris
BW - Cytophaga Psychrophila
BA - Aeromonads
BT - Mycabacterium Sp.
BV = Vibrio Anguillarum
BS - Salmonella
BO - Chills Oregon Bleb, Strawberry
BP = Pseudomonads
BU - Unidentified Bacteria
BAGD = Aeromonad Gill Disease

Copepods

CS - Salmincola

Environment

EG - Environmental Bubble Disease
ES = Environmental Sunburn

Fungal

FP - Phoma Herbarrum
FS - Saprolegnia

Mussels

MB = Glochidia

Nematodes

NC - Cystidicola

Nutritional

DD - Nutritional Drop Out
DG = Nutritional Gill Disease
DS = Nutritional Sunburn
DN = Malnutrition
DC - Nutritional Cataract

Ova

OF - Fungus
OB - Blanks
OS = Soft Shell

Protozoa

PCOS - Costia
PTRC - Trichodina
PICH - Ichthyopthirius
PAMB = Gill Amoeba
PEPI - Epistylus
PSCY - Scyphidia
PCOL - Colponema
PTRY - Trichophyia
PCRY - Cyrptobria
PBOD = Bodomonads

Sporozoa

SC = Ceratomyxa Shasta
SW - Myxosoma Cerebralis
sx = Myxidium Minteri
SM = Myxobolus Insidiosus
SH = Henneguya
SD - Dermocystidium
SL = Chloromysum Majori
SP = PKD

Tremadtoda

TE = Diplostomulum Spacthaceum
TG - Gyrodactylus
TD - Dactylogyros
TS = Sanguinicola
TB = Neascus
TN = Nanophyetus Salmincola

Undertermined Etiology

UE = Epitheliocystis
us - Strawberry Disease
USC = Scoliosis
UB - Bleb
UC = Chills
uw = White Spot
EC - Chills Oregon Bleg, Strawberry
PU = Unidentified Parasite

Viruses

VH - IHN
VP - IPN
VE - VHS
VN - VEN
VR - Herpes
vu - Unidentified Virus

LOCATION

Definition-Location where work is being accomplished or where fish are being evaluated or released.
Coding- 8-digit code:

First 2 digits, General Area

16 - Idaho
32 - Nevada
41 - Oregon marine
43 - Oregon fresh water
52 - Washington marine
53 - Washington fresh water
99 - Other

Second two digits, Local Area

Washington Fresh Water

99 - AT THE HATCHERY
If not at the hatchery the first 2 digits of the Water Resources Inventory Area (Table 22.5) are used to identify all other WA recovery areas except the Columbia River which is 25.
27 - Washington lakes

OREGON

25 - Oregon fresh water (Columbia system)
35 - Oregon fresh water (other fresh water areas)
37 - Oregon lakes
98 - Oregon hatchery racks

Idaho

25 - Idaho fresh water (Columbia system)
77 - **Idaho** lakes
95 **- Idaho hatchery racks**

Last 4 digits, Sub-area

Washington Marine (01-13)

Coding for Washington commercial marine areas can be as little as a repeat of area coes 1 thru 13 plus sub-area designations (4B, 8A, 9A, etc.) or can be more specific locations such as tribal area designations.

For sport areas, the same codes apply (01-13) although more specific codes may be allowed.

Washington Fresh Water (01-24)

Coding for Washington fresh water areas based on the WDF Water Resource Inventor-v Areas code designations. The last 4 characters of the WRIA will serve as the sub-area code.

Washington Hatcheries

NOOF - Nooksack WDF
HOOF - Hoodsport WDG
SESP - Sea Springs
ELSN - Elson Creek
QUIL - Quilcene
WLCT - Walcott Slough
QUIN - Quinault
MAKA - Makah
ABER - Abernathy
SPCK - Spring Creek
WILL - Willard
LWS - Little White Salmon
CRSN - Carson
CSDP - Carson Depot Springs
LVNW - Leavenworth
ENT - Entiat
WNRP - Winthrop
LSCK - Lonesome Creek
CTCK - Chalatt Creek
QNLK = Quinault Lake
KLCK = Kalama Creek
LELW - Lower Elwha
TPCK - Tulalip Creek
CGCK - Cowling Creek
AGCK - Armstrong Creek
SKCK - Skookum Creek
CHCG - Chambers Creek Game Dept. Hatchery
ABEG - Aberdeen Game Dept. Hatchery
SALM - QDNR Salmon River
GRCK - Grovers Creek
MNCK - Mission Creek
LSP - Lummi Sea Ponds
PWG - Puyallup Game Dept. Hatchery
BELG - Bellingham Game Dept. Hatchery
CHIM - Chimicum School
DIRU - Diru Creek

COWL - Cowlitz State Hatchery
BSRP - Bear Springs Rearing Pond
GRNF = Green River WDF
PUYF = Puyallup WDF
PGB - Port Gamble
SKAF = Skagit WDG
DESF - Deschutes WDF
SQPN - Squaxin Salt Pens
ISQF - Issaquah WDF
SKYF - Skykomish WDF
KECK - Keta Creek
ENIT - Enetai Creek
SOLF - Solduc WDF
WAAT - Waatch Creek
KALF - Kalama WDF
SAMF - Samish WDF
TEN - Ten O'clock Creek
GEOF - George Adams WDF
BOLD - Boulder Creek
HOKO - Hoka Rearing Pond
MRST - Marrowstone
PGB - Little Boston
QNRR - Raft River
SUGP - Gorst Rearing Pond
SUSP - Agate Pass Sea Ponds
SUWP - Webster's Pond, Dogfish Creek

Columbia River System (25)

0000 - Columbia River below Bonneville
2000 = Columbia River above Bonneville
0001-0999 - OR tribes below Bonneville
1001-1999 - WA tribes below Bonneville
2001-2999 - OR tribes above Bonneville
3001-3999 - WA tribes above Bonneville
5000 - Snake River mainstem (WA)
5001-5999 - Snake River tribes (WA)
6000 - Snake River mainstem (ID)
6001-6999 - Snake River tribes (ID)
7001-7999 - Snake River tribes (OR)

Oregon Fresh Water (30 & 35)

Columbia River (see above)
Other fresh water areas:
0001 - Little Nestucca - ODFW code 24.2
0015 - Rogue River - ODFW code 18.15
0016 - Umpqua River - ODFW code 18.16
0050 - Siletz River - ODFW codes 16.50, 16.51
0185 - Siuslaw River - ODFW code 18.185

Oregon Hatchery Racks (98)

WMSP - Warm Springs
EGCK = Eagle Creek
Others to be defined as necessary.

Idaho Fresh Water

See Columbia System, other areas as necessary.

Idaho Hatcheries

DWOR - Dworshak
KOOS - Kooskia
HGMN - Hagerman

MARK TYPE

Definition-Identification for type of mark and/or tag found on a particular group of fish.

Coding ·

CW	=	Full length CWT and complete adipose clip
CN	=	Full length CWT and no adipose clip
CA	=	Full length CWT and partial adipose clip
Hw	=	Half length CWT and complete adipose clip
HN	=	Half length CWT and no adipose clip
HA	=	Half length CWT and partial adipose clip
cc	=	Color coded tag
xx	=	X-ray tag
RE	=	Rare earth tag
FB	=	Freeze brand
TC	=	Tetracycline
D	=	Dorsal fin clip
PA	=	Partial adipose clip, no CWT
AD	=	Completed adipose clip, no CWT
AN	=	Anal fin clip
LV	=	Left ventral fin clip
RV	=	Right ventral fin clip
LP	=	Left pectoral fin clip
RP	=	Right pectoral fin clip
LM	=	Left maxillary clip
RM	=	Right maxillary clip
CD	=	Caudal fin clip
DT	=	Dart tag
CG	=	Full length CWT and complete adipose clip · right ventral
CH	=	Full length CWT and complete adipose clip · left ventral
AG	=	Adipose clip · no CWT · right ventral
AH	=	Adipose clip · no CWT · left ventral

Multiple marks will be defined as necessary.

METHOD OF COUNTING

Coding-
01 - Retention rate X electronic count of release
02 - Retention rate X partial electronic count of releases
03 - Retention rate X (- originally tagged-observed clipped mortalities)
04 - Retention rate X water displacement
05 - Retention rate X weight of release
06 - Retention rate X (- originally tagged-estimated mortalities)
07 - Retention rate X mark-recapture estimate
08 - Retention rate X best guess
09 - Electronic count of tagged release
10 - Machine counter
11 - Human counter
12 - Retention rate X number originally tagged
13 - Number originally tagged minus mortalities
14 - Weight sample
15 - Water displacement
16 - Electronic count
17 - Weight sample minus mortality
18 - Machine count minus mortality
19 - Number originally counted

SPECIES

Definition-PFMIS species code.
Coding-

CHS	-	702	-	Chum
cos	-	703	-	Coho
SOS	-	721	-	Sockeye
PKS	-	723	-	Pink
CUR	-	730	-	Chinook of unknown race
SUC	-	731	-	Summer chinook
FCS	-	732	-	Fall chinook
WCS	-	733	-	Winter chinook
scs	=	734	-	Spring chinook
WST	=	742	-	Winter steelhead
SST	-	743	-	Summer steelhead
RBT	-	501	-	Rainbow trout
CUT	-	511	-	Cutthroat trout
KOE	-	525	-	Kokanee salmon
LAT	-	523	-	Lake trout
DVT	-	531	-	Dolly Varden
ATS	-	741	-	Atlantic salmon
BKT	-	522	-	Brook trout
BNT	-	521	-	Brown trout
URB	-	735	-	Up river bright FCS
LFC	-	736	-	Late fall chinook